TRACK TECHNIQUE

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Effectiveness of Twice-a-Day Training

by A. Formichev and A. Fruktov

Great achievements in any form of sport depend largely upon training methods and volume of training, since these factors provide the thorough physical preparation of the athlete.

One reason why our athletes are lagging in the middle distance events is insufficient number of workouts per week, which considerably affects the volume of work accomplished.

It is known that some of the strongest foreign middle distance runners train twice a day. Twice-a-day training is also utilized by many of our better runners, in sprints, middle distances, long distances, marathons, and walks (e.g. Zhukov, Grachev, Artinyuk, Zakharov, Virkus, Popov, Filin, Lavrov, Panichkin, and others). Some athletes work out twice a day only during certain periods of the training season (Okorokov, Pipyne, Tsimbalyuk).

Here is the type of twice-a-day weekly training done by Masters of Sport Vladimir Okorokov and Aleksandr Artinyuk[1] during April, 1959:

Training of Valdimir Okorokov:

1st day. Morning: Alternate runs of 100m fast plus 50m slow, 35-40 min. Evening: Slow running for 15-20 min.; general development exercises, 15-20 min.; accelerations of 3 x 80-120m, interval running of 15 x 400m in 65 with 400m slow after each.

2nd day. Morning: Slow running, 6-7 km; general development exercises, 15-20 min.; accelerations of 3 x 80-120m. Evening; Slow running for 15-20 min.; general development exercises, 15-20 min.; accelerations of 3 x 80-120m; interval running on grass, 100m fast plus 50m slow, 35-40 min.

3rd day. Morning: Interval running on grass, 100m fast plus 50m slow, 35-40 min. Evening: Slow running for 15-20 min.; general development exercises, 15-20 min.; accelerations, 3 x 80-120m; repetition running, 8-10 x 300m, 5 min. rest between each.

4th day: Morning: Slow cross country running, 5-8 min. Evening: Slow running for 15-20 min.; general development exercises, 15-20 min.; accelerations of 3 x 80-120m; interval running, 100m fast plus 50m slow, 35-40 min.

5th day: Morning: Interval running on grass, 100m fast plus 50m slow, 35-40 min.; general development exercises, 15-20 min.; accelerations of 3 x 80-120m; 15 x 400m interval running at 65 sec. pace with 400 m slow in between each.

6th day: Morning: 6-8 km cross country. Evening: one hour cross country.

7th day: Rest.

Track Technique

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Training of Aleksandr Artinyuk:

1st day. Morning: Running at medium pace, 15 min.; 12 x 100-120m uphill; running at medium pace, 15 min.; general development and special exercises, 30 min. Evening: 2 hours of cross country in hilly areas at medium pace.

2nd day. Morning: Running in hilly areas at fast pace, 30 min.; special exercises, 30 min. Evening: Warm up for 20 min. (running plus exercises); 30 x 100m uphill, fast.

3rd day. Morning: 50 min. soccer; general development exercises, 30 min. Evening: Warmup; running with accelerations, 20 min.; 30 x 100m slow running.

4th day. Morning: Slow running, 15 min.; general development exercises, 20 min. Evening: Rest.

5th day. Morning: Running with accelerations, for 15 min.; 10 x 100m uphill; general development exercises, 30 min.; 7 x 30m from crouch start. Evening: 30 min. cross country; 6 x 300m, fast; slow running for 15 min.

6th day. Morning: Slow running with minor accelerations, 15 min.; general development and special exercises, 30 min. Afternoon: competition in cross country, covering 1000m in 2:32.4.

7th day Morning: Cross country in hilly areas, 30 min.; general development exercises, 20 min. Afternoon: 2 hours cross country in hilly areas.

Twice-a-day training permits one to increase the load. Moreover, a more frequent exchange of stages of work and rest promotes a better recovery of nervous and muscular energy. This is upheld by the research of Egolinski (1956), where it was found that during work on the arm erg-o-graph,[2] the best results were obtained during conditions of two workouts a day.

The problems we posed were to explain how athletic results and physiological indices vary with the middle distance runner when training once per day as opposed to twice per day, but performing the same total amount of work in either case. The subjects of our experiments were two groups of second-class runners.[1] The first group trained in the morning, the second group mornings and evenings.

After one month of training the performances of all the athletes improved, but the speed at which the control distance was run improved considerably more with the second group, which was training twice a day.

This improvement is an indication not only of increased strength and mobility of exterior processes (stimulation or restraining of muscles), but also of a more complete regulation of all functions of the organism.

The influence of the training was also reflected by changes in pulse rate and breathing. At the end of the training period, most of the athletes in the first group recovered from a given load in 4-5 minutes (women in 6-7 minutes), according to pulse rate. The time of pulse recovery for the second group was from 2-5 minutes less.

Thus, training done twice per day was also more effective in influencing the cardio-vascular system.

We considered it essential to conduct research in the laboratory, also. Two groups, each consisting of two people, carried out work on the arm erg-o-graph. Athletes of the first group trained once a day, and the second group twice a day, with the same overall load for all four. Rate of work was 70-75 movements per minute, and the maximum.

The training was continued for two months. All athletes improved in ability to work, but this improvement was greater in the second group than in the first. Hence, in the laboratory experiments also, athletes who trained twice a day displayed a greater capacity for work.

Our investigatigation showed an unquestionable advantage in working out twice a day. The question of the effectivemess of this method of training merits further examination, in practice.

(The authors are members of the State Central Order of Lenin Institute of Physical Culture, Russia. Reprinted from the February, 1960 issue of Light Athletics, published in Moscow, Russia. Translated by Gar Williams.)

1. Russian athletes are ranked 3rd class, 2nd class, 1st class, and Master of Sport according to their achieving certain prescribed standards.

2. Erg-o-graph - apparently an appartus that records the strength and relaxation functionings of muscles.

How Russian High Jumpers Succeeded at Rome

by V. Dyachkov, U.S.S.R. High Jump Coach

Prior to the 17th Olympic Games at Rome in 1960, the American John Thomas was the universally recognized overwhelming favorite to wim the high-jump event. As world record holder at 7' 3 3/4",(2.22 m.), it was predicted he would have an easy victory. Taller than all his opponents at 6' 5¼", (1.96 m.), who could really oppose him?

We did not reason in this manner. A different opinion was harbored by our athletes, who on more than one occasion had tasted sweet victory over the strongest jumpers in the world.

The result of the Olympic battle is well known. The victory of the Soviet jumpers shocked the stadium and provided the greatest sensation of the games. What happened? How could two Soviet jumpers, Robert Shavlakadze and Valeriy Brumel defeat the famous John Thomas, and our third athlete, Viktor Bolshov, tie him?

To me, as coach of the Russian Olympic high-jumping team, it is quite clear how this sensational Olympic jumping victory was prepared and accomplished.

When John Thomas began his attack on Yuriy Styepanov's record the winter prior to the Rome Olympics, we in turn prepared our attack on Thomas. It was of prime importance to remain calm, not panic, and convince our athletes that it would be possible for them not only to equal Thomas' results during 1960, but also to defeat him in the Olympic duel. Regardless of forthcoming serious competition within Russia, it was necessary at the very beginning of the training year to prepare the jumpers psychologically for the main competition of the season - the Olympic Games. They had to consider other meets as being on a par with training, i.e. as a means of increasing skill, cultivating will power, and acquiring the habits of independent action under competitive conditions.

Individual differences between the jumpers selected for the Russian Olympic team were great. Shavlakadze, with a best mark of 6' 11 7/8", (2.13 m.), was 27 years old, while Brumel, whose best was then 6' 7 7/8", (2.01 m.), was only 18. Careful attention was therefore paid to individual difference in their training. In general, their training was based on a large volume of diversified physical conditioning, emphasizing speed-strength. This type of preparation occupied half and sometimes more of the training time.

Our high-jumpers used a great deal of specialized conditioning exercises, such as jumps with weights attached to different parts of the body, jumps without weights, and weight-lifting exercises, all designed to develop and reinforce "jumping strength" or spring. Only a small portion of the time (12-16%) was devoted to jumping over the bar. For perfecting technique they used a considerable amount of exercises that imitated the jumping act or movement.

The training load was increased by intensifying the effort in the speed-strength exercises, and not by increasing the volume, particularly in the group of specialized conditioning exercises. We increased the average and maximum weight being lifted, the weight carried during jumping exercises, the height of the high-jump bar, etc.

The proportion of strength exercises compared to amount of overall training during the competitive season not only did not decrease, but in fact tended to increase. Thus Shavlakadze's weight-lifting exercises took up 11.5% of his training work during the preparatory season and 17.4% during the competitive season, and Brumel's took up 24.7% and 25% respectively.

Great significance was attached to technique, especially in the training of the young jumpers Brumel and Bolshov. During the preparatory season we worked out problems dealing with the structure of main types of movements (the run-up and take-off) and also with the mastering of the rhythm of movements in the run-up (the latter during the second half of the preparatory season).

During the first half of the competitive season we improved upon structural elements of the jump as related to rhythm of movement, and the rhythm of the jump as a whole was perfected. In the second half of the season, this rhythm of movements was strengthened in connection with a continually increasing intensity of the efforts of the training jumps, i.e. with training height being raised.

It was extremely important to distribute the training load correctly throughout the year and to calculate the individual curves precisely, in order to reach a peak at the necessary time.

The "load curves" for basic types of training exercises for Shavlakadze and Brumel are shown in the accompanying table. The intensity of the jumps was gradually increased as the season approached, but the main rise in training height was made in June and August during direct preparation of the jumpers for the Olympic competition.

Each jumper was checked regularly by physicians and physiologists of the Central Scientific Institute of Physical Culture, and the training load was regulated carefully according to physical condition and ability.

Thomas' training was set up differently. Summer and spring competition was for him an end in itself, this end being a world record. This goal was accomplished, but after his phenomenal jump of 7' $3\frac{3}{4}$" (2.22m) his form gradually deteriorated. Moreover, appearing in the USA exclusively, he did not become accustomed to tenacious struggles against vicious opponents. Victories were easy for him, and his will power did not undergo the necessary hardening. He engaged in no extended competition (over 5-6 hours) such as occurred in the Olympics.

Our jumpers pictured all these weak facets in Thomas' preparation, and soberly weighed their chances. The most important moments for our jumpers were when they trained side by side with their competitors in Rome. Of special significance here was tactical psychological preparation, which began on the very first day of their stay in the Olympic village.

On more than one occasion during the Games, sport-writers reported in newspapers on the psychological attacks undertaken against our jumpers. By demonstrating Thomas' skill in one of his workouts, they sought to depress our lads and thereby eliminate competition. On one occasion following an inaccurate measurement by one of the reporters present at a training session, they announced that Thomas had jumped 7' $\frac{5}{8}$" (2.15m) (whereas the bar was actually no higher than 6' $10\frac{5}{8}$" (2.10m), and afterward, without inquiring into the effect of this demonstration, they published a story that Thomas had set up a psychological barrier for the Soviet jumpers. Actually this was a disservice to Thomas, since it made him overconfident.

We, on the other hand, tried not to display our preparations. We did not wish to exhibit the strength of our jumpers beforehand, in order to present the opposition with an unexpected surprise at the time of actual competition. We therefore towards the end traveled elsewhere for workouts, going to the well-equipped stadium at Trefontagna, which drew few visitors due to its distance from the Olympic Village (8 miles - 12.5km).

Confidence grew with each workout. Others were not aware that on the day before we had watched Thomas' jumps, all our athletes had easily and confidently jumped 6'$11\frac{1}{8}$" (2.11m) several times, and that having seen their formidable rival, they not only failed to become despondent but were all the more anxious to cross swords with him.

An explanation of the causes of Thomas' defeat can be found in my book (Dyachkov, V., "The High-Jump," published by Physical Culture and Sport, 1958, in Russian language). Incidentally, when one of the French reporters asked Thomas whether he knew that a 300-page book on high-jumping had been published in the Soviet Union, he answered that he didn't see how that much could be written on jumping, since jumping is so easy. But if Thomas had found time to read that book, he would perhaps have been more prudent. Here is what is written therein:

"Confidence as a useful quality should not lead to unnecessary and harmful overconfidence, which happens with young jumpers who are improving rapidly. Unnecessary self-assurance is harmful in competition as well as in training. In competition it leads to an underestimation of one's opponent, to a lack of the necessary mobilization of one's strength, and, in the case of an opponent's unexpected success it may evoke perplexity and lead to confusion and defeat."

During the Olympic competition, this surprise for Thomas was specially prepared, and the force of its effect on Thomas consisted in the blow being delivered not by one opponent, but by three at one time - the united trio of highly qualified Soviet jumpers.

At 9:00 AM on September 1, 1960 the qualifying rounds began. The heat was unbearable, and everyone hid from the burning sun as much as possible. The American Charles Dumas left to seek shelter in a cool subterranean passageway which connects the warmup marble stadium with the stadium "Foro Italico." When it came time for Dumas to jump he was not around. While Thomas searched for him, the next seven men in order had time to jump.

Out of the 32 jumpers who participated in the Olympics, 17 made the qualifying height of 6' $6\frac{3}{4}$" (2.00m). Out of these, 14 used the straddle (belly-roll) style, two the western roll, and one used a unique direct run-up method. Thus the straddle style has just about supplanted all other jumping styles.

The qualifying rounds lasted for three hours, but our jumpers, having cleared 6'6¾" (2.00m) somewhat earlier than the others, left for the village and had time for some lunch and a little nap before the finals. At 3:00 PM all jumpers were ready to begin the finals.

Thomas jumped last. This is usually considered to be advantageous, but in this situation everything worked against him.

Brumel was erratic. He had many misses, but fought tenaciously and gathered himself supremely at the decisive moment. Bolshov jumped superbly, but Shavlakadze excelled him in precision and in the confidence with which he cleared height after height. He was the only high-jumper who produced a personal best in the Olympiad.

Shavlakadze, Thomas, and Dumas began at 6'6¾" (2.00m). The third American, Joe Faust, jumped poorly, and having begun at 6'2¾" (1.90m), went out at 6'6¾" (2.00m). It appeared that Dumas was well prepared and could go high enough. However, after passing at 6'9⅛" (2.06m) and waiting for his next turn for more than an hour, he was unable to gather himself for the 6'10¼" height.

The same course of tactics was followed by Thomas, but at a height of 6'11½" (2.12m) he passed. In consideration of the very slow pace at which the competition was moving, to do this was disadvantageous. A long wait knocks a jumper out of the rhythm of the competition, and one's functioning ability becomes worse. It is possible that this was done for the purpose of psychologically influencing the opposition. In the meantime, Thomas remained quiet and sat waiting his next jump with Dumas, who was already finished.

On their first attempts, Bolshov and Shavlakadze made 6'11½" (2.12m), and Brumel made it on his third try. By now, Thomas was no longer sitting, but started walking, and was visibly worried.

Height: 7'¼" (2.14m). Here for the first time Bolshov "stumbled;" his first attempt being unsuccessful, and Brumel's was likewise. But Shavlakadze continued to stagger the stadium with his confident jumping and cleared the bar on his first try. This had an effect on Thomas. Having waited for his turn for more than half an hour, he made his first unsuccessful jump, and lost his self-control to the extent that he immediately returned to the start, to take his next jump out of turn. Both our other jumpers made the height on their second attempts, and Thomas did likewise, exerting all his strength.

Time: 7:00 PM. The sun had long since gone, dusk was fading, and the stadium lights were turned on. Although the program for the day had already been completed, the high-jump duel was reaching its climax.

Height: 7'1" (2.16m). Brumel and Bolshov were unsuccessful on their first attempt, but Shavlakadze cleared on his first try. Thomas once and for all lost his nerve, knocked the bar off on his first attempt, could not collect himself, and after Brumel made the height on his second try, failed again on his next two attempts and went out.

Thus, a complete victory by our jumpers concluded this nerve-racking duel. And it was for them a reward for the tremendous effort put forth in training and for the courage exhibited in a struggle against strong opposition.

TABLE OF PRE - OLYMPIC TRAINING OF RUSSIAN HIGH JUMPERS

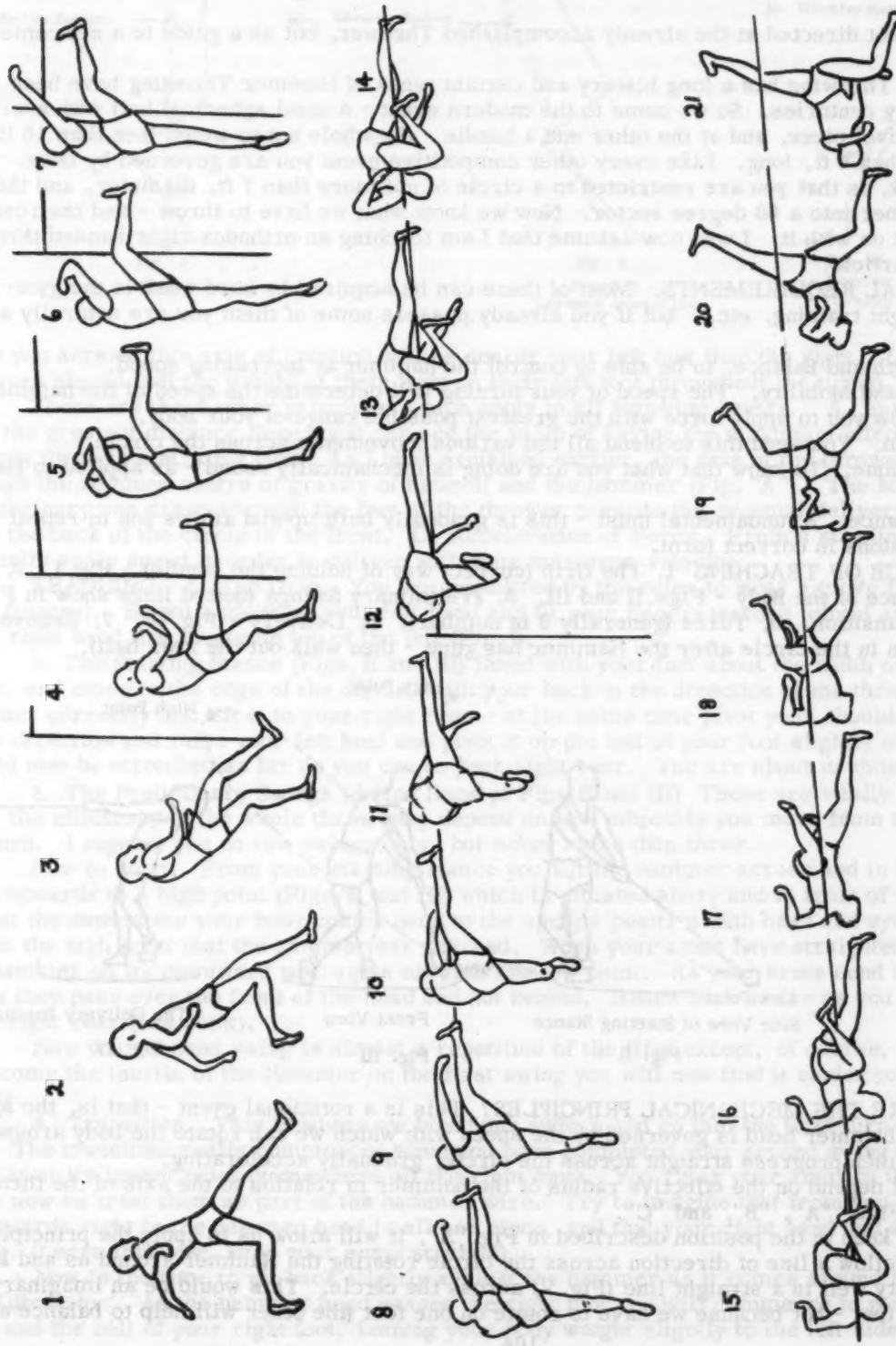
	ROBERT SHAVLAKADZE 7'1" (2.16m) 1960				VALERIY BRUMEL 7'4½" (2.25m) 1961			
	Controlled Jumps	* No. Times	No. Jumps With wts.	** lbs. lifted	Controlled Jumps	* No. Times	No. Jumps With wts.	** lbs. lifted
JAN.	40 at 6'2¾"	500	400	11,000	310 at 6'7/8"	700	1000	19,800
FEB.	100 at 6'4¾"	300	475	19,800	230 at 6'1⅝"	150	700	17,600
MAR.	125 at 6'2¾"	1100	100	17,600	75 at 6'2¾"	200	250	17,600
APR.	100 at 6'4"	200	100	28,600	210 at 6'4¾"	300	300	8,800
MAY	250 at 6'4¾"	400	50	11,000	210 at 6'6¾"	310	50	8,800
JUNE	300 at 6'8⅜"	300	100	11,000	110 at 6'9⅞"	210	100	24,200
JULY	100 at 6'6¾"	200	50	11,000	100 at 6'6¾"	0	150	11,000
AUG.	160 at 6'10⅝"	200	200	4,400	100 at 6'10⅝"	100	150	6,600

* = high kicking and jumping toward a suspended volleyball or basketball hoop ** = wt. lifting

(The above article was reprinted from the No. 12, December, 1960 issue of LIGHT ATHLETICS, published in Moscow, Russia, and translated by Gar Williams).

Highest Jump in History · Valeriy Brumel clearing 7'4½" (2.25m)

(Reprinted from Issue No. 4, April, 1961, of Light Athletics Magazine, Moscow.)



Fundamental Skills of Throwing the Hammer

by Sam Johnson

(This article is not directed at the already accomplished Thrower, but as a guide to a newcomer.)

Hammer Throwing has a long history and certain types of Hammer Throwing have been traced back many centuries. So we come to the modern event - a steel spherical ball with a wire attached by a swivel piece, and at the other end a handle - the whole not to weigh less than 16 lbs. nor to be more than 4 ft. long. Like every other competitive event you are governed by laws. The main one, I think, is that you are restricted to a circle of not more than 7 ft. diameter, and then to land the Hammer into a 60 degree sector. Now we know what we have to throw - and the restrictions - let us get on with it. I will now assume that I am teaching an orthodox right-handed thrower throughout this article.

ESSENTIAL REQUIREMENTS. Most of these can be acquired by hard work in the gymnasium - by weight training, etc. - but if you already possess some of them you are naturally at an advantage.

A Strength and Balance, to be able to control the hammer at increasing speed.

B Speed and Mobility. The speed of your turning will determine the speed of the hammer. Mobility will allow you to apply force with the greatest possible range of your body.

C Rhythm. You need this to blend all the various movements across the circle.

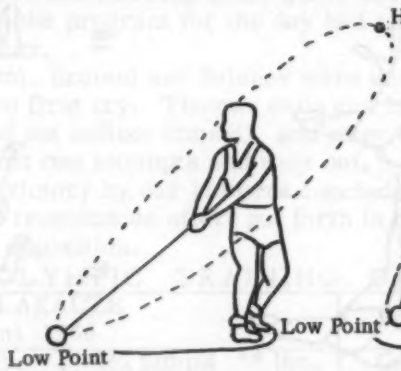
D Technique. To know that what you are doing is mechanically sound - as applied to Hammer Throwing.

E Endurance. A fundamental must - this is gradually built up and allows you to repeat various progressions in correct form.

SEQUENCE OF TEACHING 1, The Grip (correct way of holding the handle) - Fig. I. 2, The Starting Stance of the Body - Figs. II and III. 3, Preliminary Swings (dotted lines show in Figs. II and III) 4, Transition. 5, Turns (generally 3 in number). 6, Delivery - Fig. IV. 7, Recovery (you must remain in the circle after the Hammer has gone - then walk out the rear half).

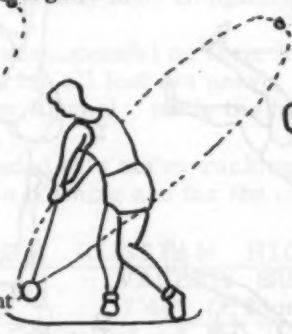
Correct Grip

Fig. I



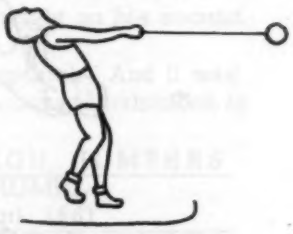
Side View of Starting Stance

Fig. II



Front View

Fig. III



The Delivery Position

Fig. IV

WHAT ARE THE MECHANICAL PRINCIPLES? This is a rotational event - that is, the speed generated to the hammer head is governed by the speed with which we can rotate the body around its own axis and then progress straight across the circle, gradually accelerating.

Much will depend on the effective radius of the hammer in relation to the axis of the thrower's body - see Figs. "A", "B", and "C".

If we can keep in the position described in Fig. "A", it will allow us to apply the principle. We now have to follow a line of direction across the circle rotating the Hammer around us and keeping our axis pretty well in a straight line (Fig. V) across the circle. This would be an imaginary line between the feet - but because we have to rotate on one foot (the other will help to balance and

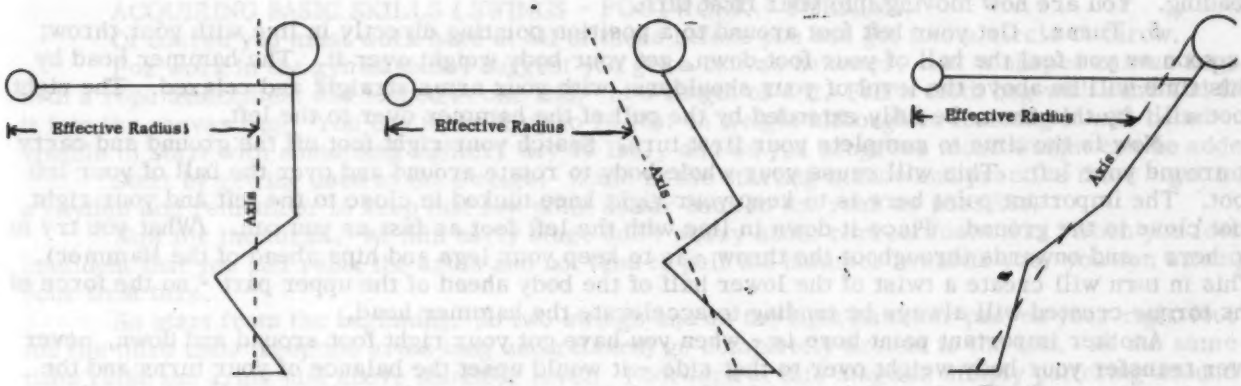


Fig. A
Correct

Fig. B
Incorrect
Too much forward lean.

Fig. C
Incorrect
Too much backward lean.

guide you across) this axis of rotation will be nearer your left foot than the right. (All Hammer throwers should feel the weight of their body on their left foot throughout the turns).

There are three other principles which apply to all throwing events. A, to apply force over the greatest distance (hence you can see the value of having the maximum effective radius. B, to apply force in a straight line. As I have explained earlier, the axis of the thrower will pass through the common centre of gravity of himself and the hammer (Fig. "A"). The straight line is an imaginary one drawn through the feet of the thrower towards the eventual delivery - Fig. V. i. e. from the back of the circle to the front. C, Acceleration of Force. From a standing position you gradually apply speed in order to deliver with your maximum velocity.

TEACHING. 1, The Grip. You are permitted by the rules to wear a glove (it does protect your fingers). So put a glove on your left hand and fit your fingers (second joints) around the handle Your right hand fits snugly on top of the left (Fig. I).

2, The Starting Stance (Figs. II and III) Stand with your feet about the width of your shoulders apart, and close to the edge of the circle, with your back in the direction of the throw. Grip the hammer correctly and lift it to your right rear - at the same time pivot your shoulders round in the same direction and raise your left heel and pivot it on the ball of your foot slightly outwards. You should now be stretched as far as you can to your right rear. You are about to commence.

3, The Preliminary Swings (dotted lines of Figs. II and III) These are vitally important. In fact, the efficiency of the whole throw may depend on how smoothly you move from the swing into the turn. I suggest you do two swings only, but never more than three.

Now to start. From your starting stance you lift the hammer across and in front of the body upwards to a high point (Figs. II and III) which is situated above and in front of your left shoulder; at the same time your body comes back to the upright position with head and eyes looking towards the high point that the hammer has reached. When your arms have straightened you guide the hammer on its downward path again towards the low point. As your arms bend downwards again they pass over the front of the head and not behind. Reach back as far as you can again to your right rear (low point).

Now your second swing is almost a repetition of the first except, of course, as you have overcome the inertia of the Hammer on the first swing you will now find it easier to move it a little faster.

4, Transition. This is where we blend our swings and go into the first turn across the circle. The transition really commences when you have completed your second swing and the hammer head is at its lowest point (somewhere off the right foot). You relax your arms to the fullest and from now on treat them as part of the hammer wire. Try to imagine that from you left shoulder downwards right to the hammer head is all one piece, and that your right hand and arm are supporting it. (Learn this now: keep your arms straight).

Now is the time to sit back slightly against the hammer as it comes around in its anti-clockwise direction. As the hammer head passes the right foot you will commence to pivot on your left heel and the ball of your right foot, leaning your body weight slightly to the left side - left shoulder

leading. You are now moving into your first turn.

5, Turns. Get your left foot around to a position pointing directly in line with your throw; as soon as you feel the ball of your foot down, get your body weight over it. The hammer head by this time will be above the level of your shoulders, with your arms straight and relaxed. The right foot will, by this time, be fully extended by the pull of the hammer over to the left.

Now is the time to complete your first turn. Snatch your right foot off the ground and carry it around your left. This will cause your whole body to rotate around and over the ball of your left foot. The important point here is to keep your right knee tucked in close to the left and your right foot close to the ground. Place it down in line with the left foot as fast as you can. (What you try to do here - and onwards throughout the throw - is to keep your legs and hips ahead of the Hammer). This in turn will create a twist of the lower half of the body ahead of the upper part - so the force of the torque created will always be tending to accelerate the hammer head.

Another important point here is - when you have got your right foot around and down, never ever transfer your body weight over to that side - it would upset the balance of your turns and the reaction of transferring the weight would tend to throw you off your line of direction. Again, keep the weight over your left foot throughout the throw. Fig. VI illustrates the position of the trunk.

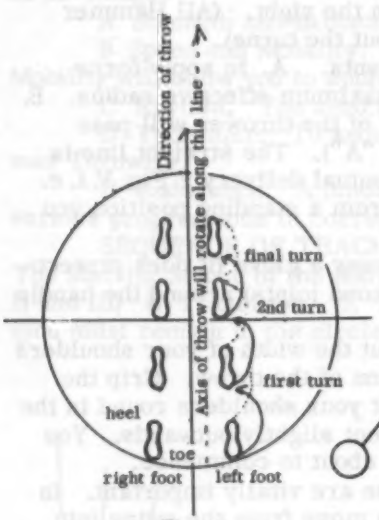


Fig. V

Each Figure Represents the Side View on Completion of Each Turn
(Note that the lean of the body increases)

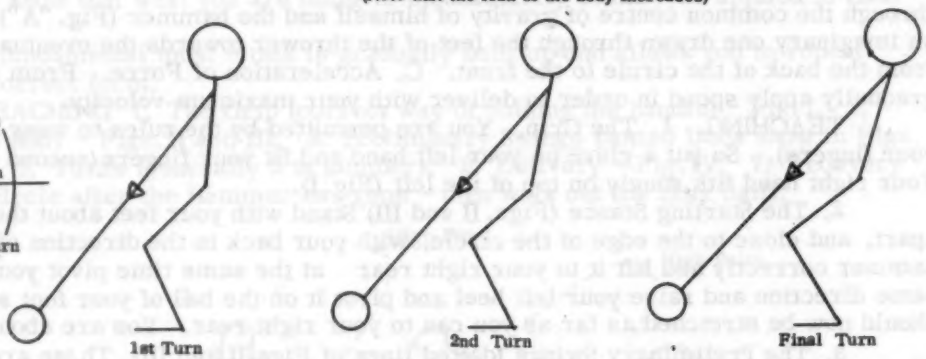


Fig. VI

Now that you have completed the first turn, go in a little faster with your second - create more speed. Then one more turn left, the third and final, which of course should be fastest.

6, The Delivery. You never just release the hammer or let it go -no- you deliver, or (a better word), you lift it up and over your left leg. How is it done? On your final turn as the hammer head is coming down and around in front of your right foot, you should start straightening your back upwards, and, as the hammer is moving around from right to left at speed in front of you, extend your left leg vigorously and lift the hammer. When it is in line with your shoulders -deliver it (Fig. IV).

7, The Recovery. If you have applied the lift to the hammer correctly you will almost certainly go out of the circle if you do not do something to check the rotation, so get your right foot around and down as quickly as possible, and at the same time lower your body weight over it and bend the knee. Some throwers manage to continue rotating on the ball of the left foot and that seems to keep them inside the circle. However, I suggest the former method. When the hammer has landed you must walk out the rear half of the circle.

KIT - SOME SUGGESTIONS. Gloves - soft and supple except the palm side of fingers which should be of strong leather to ensure reasonable protection; but not too cumbersome of course. Shoes - they must fit snugly with the sole not so thick as to give too much resistance to turning. If you can feel the surface and still have protection, that's about right.

ACQUIRING BASIC SKILLS (SWINGS - FOOTWORK - TURNING)

Of course you must work hard at all of these before you can get into a circle to throw.

For work in the gymnasium I suggest you get a canvas hammer, i. e. a shaped canvas bag, with a rope attachment and looped at one end, of a length of 4 ft. Fill a cloth bag with sand and fit it into the canvas bag. You can make it up to 16 lbs. in weight although in learning it will be advisable to start with something lighter, say 12 lbs., and as you progress more weight can be added.

Start by getting used to the Swings. Stand in the starting stance and practice them - get into a rhythm and remember to keep that low point as far back to the rear as possible.

Now for the turns. At this early stage don't worry about correct footwork. When you feel confident that you can relax the arms and not tend to pull the hammer towards you, you can attempt your first turn.

So start from the beginning, do two swings and as the light hammer passes your right foot for the third time (keep the arms long and relaxed) go completely around to the left. At the same time raise the arms just above shoulder level. Footwork at this stage is simply pattering around on the balls of both feet, to allow the hammer to rotate around the body in a complete circle.

You will find on learning these basic turning movements that all you have to do with your arms is to raise and lower them. How high should you raise them will depend on various arm lengths. Use this method to find your particular angle - Figs. VII. Get someone to hold the hammer head in front of you, about 4 to 6 inches off the ground. This is roughly the angle of your arms in front of the body. To find out the angle above your shoulders just follow the dotted line in Figs. VII. It follows in the same plane. These angles will alter slightly when you are turning at speed, for the simple reason that you have to sit down deeper to compensate for the pull of the hammer head (Fig. VI)

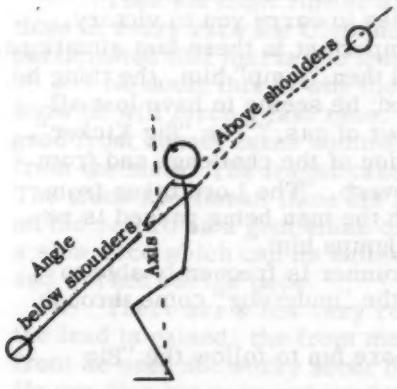


Fig. VII

Fig. VIII

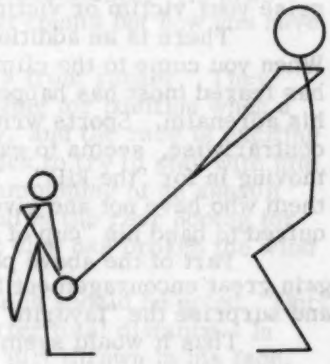


Fig. VII

Footwork. Get this right at the beginning and you will be amazed at your speed of progress. Never forget that speed is a part of technique.

In an earlier paragraph on moving into the first turn I said you pivot on your lift heel and right toe - then transfer the weight onto the ball of the left foot and then get the right foot around and down (See Fig. VIII). This illustrates one turn of the feet only. You will notice in the diagram that you also use the outside edge of the left foot as the right foot is passing around it. This does occur when you are turning at speed and the reason for it is that you are leaning the body against the weight of the hammer turning around you and this of course includes the legs.

At the beginning, practice your turns without the hammer. Just stand with hand behind back astride a straight line and do it by numbers. On "one" pivot around on your left heel and right toe until your left foot has travelled through 180 degrees, then, on "two" quickly transfer your weight onto the ball of the left foot and pivot, at the same time keep your right foot close to the left (Fig.

Front Runners vs. Big Kickers

by J. William Cunliffe

Since the days of the ancient Greek myth in which Princess Atalanta, a "front runner," was tricked by the young Hippomenes, the suitor with the three golden apples and a big finishing "kick," this has been a topic of debate. Should a runner try to get out in front and stay there in a race, or should he hold back and rely upon a sprint-like finish to pick off his competition? In track vernacular the former type of runner is called "the Beast" by his competitors because he tries to kill them off with a fast early pace, while the latter is called "the Big Kicker" because with a few well-timed, hard-kicking strides he can edge to victory at the tape.

The Case for the "Big Kick".

The most convincing argument for being a "Big Kicker" is that you will probably win more races. If you have any kind of natural coordination and sprinting ability and if you can develop enough stamina to stay within sprint range of the leaders, you will probably win more than your share of the races. Of course, these are the big ifs. The man with a natural kick has a gift that ultimately will make him a champion if he will work for it. The danger is that he may be content to hang back with the ordinary runners in a half-hearted effort and never approach his true potential. He kicks just enough to win but does not run all out enough to become confident in himself and to develop whatever hidden talent and endurance he may have.

Another advantage of running behind is that you can see how the tactics of the race are developing. If an opponent shows signs of weakening, you can pick him off before he readjusts to his problem. If a couple of rivals have been dueling for position and one has been "taken", you can move in on the loser and also take him more easily than otherwise. If you see a tactical situation developing, such as a "box" or a "sneak away", you are in a position to take advantage of it. If, near the end of the race, you are still in contention, you may pick your own time and place to surprise your victim or victims and steal enough precious yards or inches to carry you to victory.

There is an additional hidden advantage which is extremely important in these last situations. When you come to the climax of the race and you "stalk" a victim and then "jump" him, the thing he has feared most has happened. He feels disappointed and discouraged; he seems to have lost all his adrenalin. Sports writers express this fact by saying, "He ran out of gas." The "Big Kicker", contrariwise, seems to gain adrenalin from the thrill of the expectation of the challenge and from moving in for "the kill". This seems to give credence to the old proverb, "The Lord takes from them who have not and gives to them that have." It appears as though the man being passed is required to hand his "cup of adrenalin" to the man who claims it as he jumps him.

Part of the above phenomenon is due to the fact that the rear runner is frequently able to gain great encouragement from the novice track fans who like to see the "underdog" come through and surprise the "favorite".

Thus it would seem at first glance that it would not only be more fun to follow the "Big

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VIII) and place it down alongside the left.

Now you are ready for the second turn. Keep at this until you can do 8 to 12 turns. Remember to keep your trunk upright and to keep the weight over on your left foot. Practice - Practice - Practice.

To progress you can do these exercises with your sandbag. Start off with your two preliminary swings, then off into your first turn. As you get more confident and have more control over your balance add turn No. 2 and so on. Work up to doing 6 to 8 turns.

(Chief Petty Officer Sam Johnson, Chief Instructor of the Royal Navy School of Physical Training, Portsmouth, England, is a veteran of more than 20 years in athletics. Still active in competitive hammer throwing, he actually demonstrates and performs the various field events.)

Kicker" school of coaching, but it would pay off physiologically, psychologically and practically in winning more races. If this be true, who would be so foolish as to run in front?

The Case for the Front Runners

Fortunately front running also has much to offer. Perhaps it has even more to offer a beginning runner than does "kicking".

Because a great runner must know pace, the novice will find front-running will force him to learn pace and to take the responsibility for it in any race. Perhaps the worst thing a runner can say after a race is, "I had a lot left! I should have run faster and sooner!" The front runner plans to give all he's got, and he should never have to make the above excuse. Front-running is particularly good for the inexperienced runner because the struggle to keep running at the end of a race when he has given his all forces him to develop new stamina and greater courage. The body will gradually adjust to this recurring demand, and the front runner is subsequently able to increase the distance over which he can maintain his pace. Therefore, eventually he forces himself into the championship class.

It is this philosophy of "forced self-improvement" that is significant about a front runner. He does not like to run a "cheap" race. He is an optimist at heart and expects every race to be his best-ever. His concern with pace refuses to let him set any limits upon himself; so he is willing to experiment with the clock in hopes of beating it and "himself". Every race is an opportunity for him to be master of the race and, what is more important, to be master of himself. He takes off in the race as if he were someone really going some place! He has fun running and testing his opponents to see if he can "burn them out" or discourage them early. Nevertheless, his real opponent is time, not those who happen to be running in this particular race. As he fights his way through each race, he is challenging every runner who is now running or who has ever run this particular distance. He is striving for an ideal. To achieve it he must carry the race on his own shoulders. He asks no help from a pace setter or a windbreaker. He sees himself as a sportsman striving for that "best-ever" race, which in itself is satisfying to him whether he wins or loses.

Thus the front runner approaches the Olympic standard of amateur excellence. He practices in every race the Olympic code, which says that it is not winning that counts but how you have participated that marks the true sportsman.

No doubt this is why the experienced track fans so greatly admire a front runner. They know he will force a fast race. There will be no loafing around and jockeying for position when a good front runner takes command. Everyone is on his mettle immediately, and the race is exciting from the start. The leader takes the offensive and dares the rest of the pack to try to stay with him. The track sportsman likes his forthright challenge, his optimism, his championing of an assault on the record as a gentleman of the sport, instead of "pussyfooting" around in the rear hoping for a slow race which can be stolen with a short burst of speed after someone else has broken the wind and worked out the pace.

There are a few very real strategic advantages to front running which should be noted. Once the lead is gained, the front man has the inside track and thus runs a shorter total distance. In front he need not worry about being spiked or boxed or elbowed or getting dirt thrown in his face. He can plan his race and set his own pace for various parts of it as he believes his condition will allow it.

But again we say that these are minor advantages. The real advantage lies in obeying the old Biblical adage which charged, "Whatsoever thou mindeth to do, do it with all thy might." For if you have been true to the best within you, then even if you lose, the other runners know they have faced a true competitor who has asked no quarter, who has refused to compromise and who has given his all! If you have not set the record, you have the great personal reward of knowing you have helped someone elso achieve that distinction, which probably would not have been possible without your supreme effort.

As the distinguished Roman, Cicero, said, "When you are aspiring to the highest place, it is honorable to reach the second or the third." Perchance you would rather leave the histrionics to Cicero and just remember that being a front runner seems to satisfy that ancient urge inculcated by our cave-men ancestors who learned that all those who survived were front runners. The "clever" ones who held back to be the "Big Kickers" generally provided the "Big Dinners".

(J. Wm. "Bill" Cunliffe is the father of Olympic 800 meter runner Ernie Cunliffe, a noted front runner who collaborated on this article.)

Training the Mind-Body in Track and Field

by Dr. J. Kenneth Doherty

Any sound approach to training for competitive running, as in any sport, must plan as deliberately and specifically for the "mental"[1] factors. This statement is neither new nor even young. We can be certain that old Flintstone himself practiced its truth as he developed his ability to run both long and fast so as to eat and to escape being eaten, even though expressing it in words would have been beyond him.

And yet, with all our claims to scientific training methods, we still tend to narrow our thinking, our coaching and our research on training methods as though man were primarily a machine. Our coaching textbooks deal primarily with what the body must do to be trained. We value our training systems primarily on the basis of miles covered, pace carried, work intensities or heart-lung-blood effects. We study physiologies of exercise. We welcome the contributions of Sports Medicine to our work.

This is all to the good. But where is the practical realization that man's achievements in sports, as in all walks of life, are as much the result of mind and attitude as they are of body capacities? What training system is based upon mind-body as an inseparable concept in which planning for the mental aspects of development precedes or is on an equal basis with the physical aspects of development? Where are our textbooks on the psychology of exercise to balance those on physiology? Where are the sports psychologists to match our medical doctors in the field of Sports Medicine?

Human achievement, whether it be climbing Everest, seeking world peace, or merely running a half-mile in less than two minutes, can be viewed as having three aspects: (1) a task, (2) a performer who must think-see-feel the task as a challenge, and (3) the freedom, the plan, and the means whereby this challenge can be hopefully attempted.

In track and field the task itself can be stated simply and clearly, though this clearness is deceiving: to run, jump and throw faster, farther and higher. To date our main efforts have been concentrated upon the third: to discover and use the physical means whereby this task can be achieved. We have been primarily concerned with better mechanical methods, with better styles of throwing and jumping, and with better methods of training our circulo-respiratory systems. In contrast, we have been relatively unconcerned and even careless about the second aspect, the creation and maintenance of optimum motivation within the individual performer.

Consider the thousands whose competitive running has been limited to one or two experiences, not because they lacked talent for running but because in their first encounters the task was beyond their immediate abilities, They had no physical or mental preparation for the event. They were matched against men of greater maturity or training or talent. They had no way of knowing this. No wonder they found no challenge in running and quit the sport. One wonders if the practice in lower school grades as in college intramural meets of throwing everybody in together has not lost far more fine prospects for running than it has discovered? One wonders if the common practice at all school levels of providing competition after only a few weeks of training doesn't often deal a blow to the integrity of many fine potential runners from which they recover slowly or not at all. In contrast Europeans spend months developing but also discovering abilities so that competition can be graded accordingly.

If one may be personal for a moment, I am certain that such an experience in the 9th grade convinced me I was no distance runner. It influenced my training throughout eight years of competition in most track and field events and into the 1928 American decathlon championship. Training for running had to be done of course, but it was a bore. Not until the Olympic Games decathlon, where some quirk of will or necessity enabled me to win my section of the 1500 meters run, and against the Finns at that, did I realize that this could be one of my best events.

1 These quotation marks call the reader's attention to the essential unity of mind-body attempted here. However convenience leads to their ommission in the rest of this article.

Throughout the fall of '28 I trained at distance not as a dull chore but as an exciting challenge. Within three months I felt a satisfaction, even a thrill that other events had never given me. Although the 1929 decathlon championships were held at mile-high and oxygen-low Denver, my time for the 1500 meters was 20 seconds faster than ever before and helped to produce a new American record.

The obvious reply to this tale is that a man so weak-willed as to let one boyish experience determine his entire career deserves what he got. And yet it is just such callousness to boys' sensitiveness that helps create the problem.

Maintaining the challenge of training is but one phase of our coaching job. Even when this is well done we still face the problem during those endless hours preceding competition of balancing the fear of failure with self-control, eagerness, and relaxation. Here also the examples are endless, John Thomas at Rome was one, though I think his tension rose on the field itself as he watched the Russians clear every height. Ray Norton was another.

So many have wondered about Ray Norton's Olympic performances as compared with his world record sprinting in April. In April Ray was as smooth and free-flowing as Jesse Owens on May 25, 1935. In Rome he was withdrawn, rough in action, and at least three yards slower at 200 meters. Causes could have been primarily physical. Some said he had reached his peak (whatever that is) too soon. His excellent coach, But Winter, mentioned to the writer in Rome that a possible recurrence of mononucleosis might be at work. But the very fact that such thoughts were in their minds indicates the "mental" effects that were certainly present.

Such human qualities as self-control, relaxation, self-confidence, concentration can be generalized for purposes of understanding, though even that is an illusion. But for purposes of action, they are always specific to a specific person doing a specific thing at a specific time and place. Further, they do not exist within us at this level or that, but always within a range of potential. The exact level at which they occur in action varies with growing maturity and experience but can be trained for a specific task just as we train physical coordination toward excellence in specific sports skills. Zatopek wrote that one device he used to accustom himself to the pains of fatigue was to practice breath-holding while walking in the woods. "Thus I learned that will-power was no longer a problem." This is but one way. Surely there are many sound and specific ways of training for control and relaxation despite the tensions of fatigue. There must be precise "mental muscle fibers" that can be trained to lift the sand-bags of depression that come with defeat and poor performance. There must be specific teaching devices for changing dread to anticipation, doubt to confidence.

To be sure, we have our common-sense folk medicine. "You're stale, lay off for a week or so." They're effective in many cases, for the wisdom of the body left to itself is a wise thing. But I'm inclined to think such solutions are comparable to the blood-letting of yesteryear or to the tranquilizers of today. Like aspirin, they deal with symptoms not causes.

How often we are thrilled by the young and greatly talented school-boy whose early career knows only victory and record-breaking. His confidence and poise are unquestioned. But eventually he is overmatched. He loses to a better man. That's disturbing enough, but then he loses to a lesser opponent. His times do not equal those of last month or last year. His happy carefree face becomes "sicklied o'er with the pale cast of thought" as he gradually comes to doubt himself and to fear failure. During more than 30 years of track coaching I've known many such on our own squads and on those of other teams.

One of the most recent examples of a happy outcome to such a problem is to be found in the running of Max Truex in the 10,000 meters run in the 1960 Olympics. You know the story. A 4:18.3 mile while still in high school, a great record during his early college years, and then a period of downs-and-ups which failed to produce what had been expected. Max made the 1960 Olympic team just as he had the 1956 team to Melbourne. But his 3rd place (30:16.3) in the National AAU championships gave neither him nor any one else reason to hope for anything better than a nice trip to Rome.

There was one exception, Mihaly Igloi, the master trainer of Hungary's great trio, Iharos, Tabori and Rozsavolgyi. In June, 1960, Igloi told Jim Beatty that he thought Max could break the world's record for 10,000 meters. Somehow Igloi's word reached Max. After reaching Rome, Truex started training under Igloi's direction. They had only two weeks together before the Olympic 10,000 meters race, but after this brief period the gallant Max produced 28:50.2, which was 45 seconds faster than he had ever run the distance before and four seconds faster than the best 10,000 meters ever run by the great Emil Zatopek. He placed 6th, the best American performance to date

over that distance.

There is growing acceptance of the idea that powers of strength-endurance-control are present within each of us fas beyond those we now recognize, let alone use. Up to the present time evidence of these powers has come primarily by way of the abnormal or the unaccepted: from the insane, from war, from hypnosis, form the use of drugs, from far-east yoga or from religious fanatics. Medicine and science have been slow to accept or even investigate such phenomena. Only rarely does a William James (1911)[1], a Walter B. Cannon (1939)[2], or an Aldous Huxley (1959)[3] consider seriously the meaning for normal men of these so-called abnormal instances. Slowly science is beginning to study their possibilities for normal living. Hypnosis is generally accepted as one of the tools of medicine as well as of some sports coaches. Huxley claims that the Russians "are now halfway through a Five Year Plan to produce 'pharmacological substances that normalize higher nervous activity and heighten human capacity for work'."

But along with these new tools, new teaching methods are being studied. These methods do not try to add something to what the student is or has so much as they seek to add something to what the student is or has so much as they seek to discover and draw out what is already there. If facts are provided it is to stimulate thought and intellectual growth rather than to build a storehouse of knowledge.

So with sports training. Read the biographies of runners like Zatopek, Bannister, or Peters and you will find their development and achievements came primarily from within themselves, from an impulsion to run, from gradual realization of unknown powers and from increasing self-assurance. True, each had a coach but one who advised and suggested in such a way as to pull out the answers rather than to dictate them.

We have spoken of Mihaly Igloi, a man known as a taskmaster, a dictator of workouts and competitive plans. But even Igloi in the two short weeks that he worked with Max Truex had no magic power to add something that was not already present. It has been suggested that Igloi taught Truex a new rhythm of breathing. The physiologist would dismiss such a suggestion as unrealistic. I doubt the practicability of teaching a new breath pattern in two weeks after more than 20 years of breathing otherwise.

Far more reasonable is the assumption that Igloi suggested a physical change in order to produce a mental uplift. But in any case, what Igloi must have done was to help Max realize with complete certainty what he really was as a runner and what he could do. He must have calmed Max's doubtful thinking about himself. He must have helped Max to achieve a positive approach to all aspects of the Olympic race. That the race developed just as Igloi said it would must have created within Max during the race a growing certainty of success.

How much we need a "power of positive thinking" as applied to sports just as Dr. Norman Vincent Peale applied it ot the religious aspects of living. Such an approach must begin with words and theory. The duality of mind and body is so ingrained in our thinking and speaking as to make it almost impossible to do either in holistic fashion with consistent clarity.

For example, take such a word as "fatigue" which we use so constantly and carelessly. We all know that there is an effective mental-emotional aspect of fatigue. But we fail to recognize in our actions the detailed implications of this knowledge. Consider the hours we spend in studying the physical aspects of fatigue: oxygen debt, blood sugar utilization, acid accumulation, buffer action, etc. But where are the hours spent studying the "blocks" to action created by our awareness of these fatigue effects or the means whereby these blocks can be prevented or removed? In similar fashion, when we list the effects of training and the means whereby these effects can be produced quickly and effectively, why do we turn exclusively to physiologies of exercise? Why are related scientific studies exclusively in terms of the physical effects of training when the development of a positive mental attitude toward these matters is almost equally effective? We agree verbally to the definition that fatigue is a psychophysical deterrent to action which raises the level at which motives are effective. But where is the planning by which effective motives can be raised to meet the ever-increasing challenge of fatigue?

A "positive mental attitude" can be defined in many ways. For some it means mental toughness or even callousness against the pains of fatigue. They would interpret Zatopek's use of the word, "will-power" as signifying the power of will against the forces of fatigue. They would say we must learn to lift ourselves above such obstacles even though they admittedly rise higher and higher as we run faster and farther.

Others would object to such an approach as creating as much concern for the increasing height of the obstacle (in this instance, the pains of fatigue) as for our determination to overcome it. They would emphasize that Zatopek practiced breath-holding until "will-power was no longer a problem." That is to say, he had experienced the feelings of lack of oxygen so often that all negative associations were gone. No fear of harm, no doubts of his ability to maintain pace despite a rising oxygen debt. His problem was not one of developing his power of will or mind over an antagonistic body so much as of unifying mind-body action toward a particular goal.

Modern science tends to support this latter approach. The old "will psychology" with its separation and conflict of mind and body and of both with environoment is being replaced by a psychology of "wholes" in which optimum performance grows out of a purposeful"coming to terms with oneself and one's environment." Man is not an isolated entity in an antagonistic Nature. Rather he and Nature are one; he is in Nature and in no sense can be apart from or other than Nature. His problem then in all his strivings is to lose self-awareness in an isolated sense and to realize his essential oneness within and without. To take a related example, one might view the awful power of ocean waves as a conflict between wind, water and shore. But a more holistic and scientific attitude would see them as a perfectly natural inter-relationship and inter-action between these aspects of a single whole.

This is not mere theory to be tossed back and forth by arm-chair psychologists. This is a down-to-earth approach to everyday coaching. It applies to most phases of our teaching: to the attempts of endurance runners to maintain control during the increasing tensions of fatigue, to the process of maintaining optimum tension while sprinting, that is, to go "all-out" and yet be relaxed, and especially, to the teaching and learning of sports skills.

Perhaps one example from this area of sports skills will be helpful. Coaches agree with psychologists that "only right practice makes perfect." But what is right practice and how is it achieved most quickly and effectively? The very fact that one hundred coaches would have a thousand different answers indicates that no careful study has been made of the problem and that no basic and sound principles have been agreed upon. But in related sciences, in the psychology of vocational work, in the psychology of learning, the psychology of rehabilitation, a body of basic principles is being established and used.

For example, in teaching new skills, allow the end-in-view to be present but in a secondary or subconscious sense; let awareness be concentrated upon the specific means whereby this end can be achieved. In the high jump for example, as long as awareness is fixed upon clearing the bar, the learning of new methods is greatly slowed, if not made impossible. At the other extreme, so long as awareness is fixed upon an isolated phase of the jump, such as the vertical throw of the lead-leg, there will be ineffective learning.

Rather modern science would suggest some such approach as this: (1) Always assume or feel "muscularly" that there is a bar to be cleared higher than one's head. (2) Before attempting a jump, think through, or better, "feel through" all phases of the jump as a whole at this height. (3) "Feel through" a specific phase of the next jump, not as an isolated unit but as one phase of the whole action. (4) Jump in terms of this part-in-whole awareness. Finally, think and "feel muscularly" the right and the wrong of what has just been done. Throughout, recognize that habit now makes mechanically incorrect actions feel "right" and correct actions feel "wrong." This must be reversed so that right actions will feel "right" and wrong ones "wrong."

A few psychologists have studied the effects of what is called "mental" practice upon motor learning. Some have attained positive results. But again we must be careful of word meanings. Such "mental" practice must be more a matter of muscle-sense than of mind-sense. It should attempt an inactive muscle "experience" and muscle "memory" of the action both away from the field but more importantly in conjunction with practice on the field.

The writer has thought time and again of Parry O'Brien's answer to the question as to why he persisted in practicing alone with one shot, therby wasting much time in walking out some 70 feet after each put and back to the circle. "That time isn't wasted, coach. While I'm walking, I think about it, about what was right in the last put that I can continue in the next one." Parry should be asked what he meant precisely by "I think about it." I feel sure he would agree that such thinking was at least as much a matter of muscle-feeling as of mind-thinking.

Modern science would suggest that learning new motor skills is primarily a problem of acting the role of right action, of acting in a mind-muscle sense again and again until what is

Endurance Work as Protection Against Coronary and Circulatory Disorders

by Dr. Ernst Van Aaken, Waldniel, Germany

Sports activities are becoming more and more general but diseases of the heart and circulatory disturbances are also on the increase. The latter fact, in my opinion, has very definite causes; modern man avoids exertion and endurance exercise, he eats too much and poisons his blood-vessel-regulations with nicotine and other poisons. The man, however, who engages daily in an endurance sport and who lives according to proper training rules will for the most part be spared these disturbances. This is certainly true of top-flight distance runners, long-distance skiers, swimmers, bicycle riders, mountain climbers and any men who still cover long distances on foot. Even the athlete who plays ball in any way, and also boxers, weight-lifters and gymnasts will be free of circulatory disease if they avoid excessive breath pressures and have incorporated endurance exercises in the proper amount into their conditioning work.

In Freiburg, under Dr. Herbert Reindell, approximately a thousand real masters of sports, among them cyclists, runners and swimmers, were investigated and in Waldniel about three hundred middle and long distance runners. As long as they participated intensively in sports, they were not merely healthy, but were even capable of very good performances. They presented optimal physiological conditions and remained in top condition far past the dreaded peak, that is, even between the ages of fifty and sixty, providing they kept on with their sports activities. The letters which I have received from over fifty members of a club of older distance runners provide eloquent testimony. All of them are healthy; all have remained youthful and fit because of their running.

Strenuous endurance work affects the entire organism in its physiological reactions. In its demands on entire systems of organs only endurance work - as contrasted with speed or agility movements or static strength exertion - is biologically important. The human organism does not wear itself out in endurance activity as a machine does. On the contrary, the organism learns in time to adapt its regulations to the demands made upon it in such a way that increasingly stronger exertions are possible. The increase in the possibilities of regulation is a distinguishing characteristic of the training condition of the living substance.

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mechanically right gradually comes to feel muscularly right. To say it differently, such learning is a problem in kinaesthetics which maintains a whole-part-whole approach while securing the feel of right action. Right action, by the way, is always in relation to maximum performance. One learns to jump seven feet only by attempting similar heights, even though only an imaginary bar is at such a great height and the real bar at a much lower one.

So much for examples. They can be and should be continued indefinitely, for no matter how sound our principles, they have practical meaning only in specific action. But those given should point up the urgent need for similar "mental-emotional" approaches to the problems of modern sports teaching.

Bibliography

1 James, William, ON VITAL RESERVES, New York: Henry Holt and Company, 1911.

2 Cannon, Walter B., THE WISDOM OF THE BODY, New York: Appleton, 1939.

3 Huxley, Aldous, "Drugs That Shape Men's Mind," from ADVENTURES OF THE MIND, edited by Richard Thruelson, New York: Alfred A. Knopf, 1959.

Among the countless reactions in the organism to endurance exercise, perhaps the most important for life, health and fitness is the increased blood supply carried to all the organs and tissues. Through nicotine, occupational worries and overwork, haste and nervousness, lack of physical activity and resulting obesity, the blood supply, expecially in the brain and muscles, is throttled. The life stream of the circulatory system runs dry or is dammed up as an obstacle to circulation. Only in endurance activity does oxygen, with the blood as its carrier, suffuse all the organs and tissues for a period of time, while in speed activity, as in sprinting or quick heavy exertion, energy is developed without oxygen, an emergency function which uneconomically amounts to a temporary suffocation of the tissues. According to the research of Dr. Reindell, the heart develops only with endurance work, a fact substantiated daily in the investigations at Waldniel. So, for example, the heart capacity and pumping space of a sprinter (100 to 400 meters) is no greater than that of a person who indulges in little or no sports activities (500 to 700 ccm.) while the well-conditioned distance runner, long distance skier or cyclist shows a pumping capacity of 1000-4000 ccm. Unfortunately, even experts are not clear in their conception of the relative size of the heart in athletics and the term "athletic heart" still has connotations of something pathological in consultations, meetings and sport-medical professional opinions. In 1947 I coined the concept of a "performance-heart" (Leistungsherz)[1] since among both physicians and laymen the designation "athletic heart" all too often still had the idea of abnormality attached to it, a conception which stemmed from a time hostile to and ignorant of athletics. It was Reindell who ascertained that performance capacity in endurance work and enlargement of the heart pumping space - perhaps with a few particular exceptions - went parallel to each other. But even the heart of the master-runner and his circulatory system along with all the reactions dependent on it will retrogress to average performance capacity if athletic activity is given up. It is not merely a matter of engaging in sports activities for a few years at the height of one's youthful powers and acheiving a high level of performance. The fact is the athletic endurance capacity must be fought for and re-won throughout one's lifetime lest the conditions of a well-regulated circulatory system worsen from day to day. The tissues and organs age as a result of insufficient blood circulation and decreased stimulation; psychological tensions and burdens hasten the process of decay; lack of activity in physical and mental functions brings about inertia of the mental processes and breeds indolence, excessive appetite and actual laziness until the life stream finally becomes dammed up. The result is disorders in the circulatory system, lack of blood diffusion in the heart and in many cases today the final result is a coronary occlusion, where a whole heart-muscle-fiber complex is instantaneously deprived of its blood supply, usually culminating in a fatal stroke. Not sanatoria with or without rest cures or curative baths, not four to six week vacations during the year, not self-denial or special diets nor medication or wonder-drugs can in the long run stay the decay process of the circulatory system regulations unless active daily endurance activity keeps the blood circulation going and supplies the entire organism with oxygen.

Demanding endurance work on a daily basis is the secret recipe of the older athletes who acheive astounding performances even beyond their fifties. The rector of the Cologne Sports Academy, Prof. Diem (age 75), the Bremem marathon runner, Meyer (age 72), and the Essen marathoner Blumensaat, who at 49 still rates among the best, along with many other runners, swimmers, cyclists, walkers, mountain climbers, etc., who at an advanced age still possess youthful organisms, will serve as outstanding examples. Medical science, schooled in recognizing and treating diseases, has only barely begun to investigate the really fit man, to put their findings about his way of life at the service of the sick and to bring up the young according to the findings of sports-medical research.

It is high time that physicians, and above all sports-medicine people, teachers, educators, coaches, in fact every one, learn to recognize the value of endurance exercise, not just theoretically, but practically, so that the young can be trained according to principles learned from the above-mentioned examples of physical and mental health lasting even into old age. In the same way the old can be protected from the dreaded disturbances of the heart and the circulatory system.

REFERENCE

1. Sport und Gymnastik, Fachzeitung für den Deutschen Leibeserzieher, Nr. 1, Jahrg. 1, "Gibt es ein Sportherz?".

Broad Jumping

by A.R. Malcolm

(From "Some Points On Long-jumping," The Athlete, Summer, 1950, page 84. Vol. I, No. II.)

Much time and thought has been spent in the past few years on the study of technique and particularly on the mechanical principles upon which all good techniques are based. This article is intended to show how we are progressing, in this respect, with the broad jump.

THE BASIS OF DISTANCE

In this event we are concerned with propelling the body through the air for the maximum distance. To do this, the body needs to be driven upwards into the air to the greatest height with the maximum amount of forward speed. Ideally, therefore, what is required is the approach of a 9.3 seconds sprinter plus the lift of a 6 ft. 11 ins. jumper. Unfortunately, these two do not go hand in glove, for a person moving at that speed has not the time to develop the power needed to lift his body anywhere near the height.

What can be done then? The length of time a jumper spends in the air is controlled by the height, i.e. of his centre of gravity (c. of g.) obtained. The higher he goes the longer he stays in the air. The longer he stays in the air the further forward will his horizontal speed carry him. But in order to get higher he has to approach more slowly. Therefore, some compromise has to be made.

For the sake of the mathematically minded, here is a method of assessing which combination of the two will give the best results. The length of the jump will vary in proportion with the results of this calculation: V x H (Where V is the horizontal speed in feet per second and H is the vertical speed in feet per second.) If V equals 30 feet per second (10 yards per sec. sprinter) and H equals 12 feet per second (Approx. lift of c. of g. 2¼ ft.), then V x H equals 30 x 12 equals 360. If V equals 32 feet per second (faster than above) and H equals 10 feet per second (approx. 8 ins. less) Then V x H equals 32 x 10 equals 320.

All other things being equal, the difference in length of the two jumps will vary in the proportion of 360 to 320. If 360 were to equal a 24 feet jump then 320 would equal one of 21 feet 4 ins.

These figures for an actual jump are very difficult to come by. They can be obtained by very close observation of moving pictures but unfortunately they cannot be obtained by the eye alone. They mean that time must be spent in getting the correct proportion of each. Also they mean that long jumpers must be continually working to speed up their movements to enable them to lift their bodies high into the air while travelling at speed.

THE LANDING

There are two main points to consider: (1) Once the body has left the ground the path of the c. of g. is pre-determined. No matter what movements are made of the legs etc. they will not alter this path. Therefore, if two jumpers were to leave the ground in exactly the same way and one used the hitch-kick and the other the sail, the c. of g. of each would, if allowed, land in the same spot.

(2) With (1) being correct, any advantage in one style or another will depend largely on the landing position. This position must be one which will allow the feet to break the sand as far in advance of the c. of g. as possible and at the same time allow the body to be brought forward over the feet without touching the sand.

HERE THE DIFFICULTIES START

The two landing positions in consideration are those shown in Figs. 10 (hitch-kick) and 11 (sail).

Let us consider first of all Fig. 10 (the body is in the air, remember). If the body were in its normal erect position, then the c. of g. would be in the middle of the body approximately level with the hips or just a shade lower. Now, both legs have been brought forward in relation to the c. of g. Therefore an equal mass of body must go back, otherwise the c. of g. would be moved forward from its path. This cannot be done. But, both arms have been pushed backwards which will partially offset the movement. The resultant being that the c. of g. is not now in the middle of the body but somewhere in front of this position. (The X shows the approx. position). This then gives a distance of X (Fig. 10) as "free distance," or distance reached in advance of the c. of g.

In Fig. 11, however, instead of the body being kept upright head and shoulders have been allowed to come forward and downwards, as also have the arms. Consequently, a much greater mass has been brought forward relative to the c. of g. Therefore an equally greater mass must go backwards. The c. of g. is much further forward in relation to the body than was the case in Fig. 10. Hence the free distance Y is much less.

That is not the complete story. In the latter case, the trunk has been brought downwards as well as forwards. Therfore some other part must go upwards (we have already seen what goes backwards). In this case, the hips must go up. If the hips go up then the legs must go up with them. Therefore, the landing in Fig. 11 is delayed slightly, while the c. of g. continues to move forward and downward through the distance marked H. Whether the second gain is equal to X-Y or not, is, at the moment, unknown.

IMPORTANT POINTS

This leaves us then, for the moment, undecided as to which is the better. But, at the same time, it brings out these very important points, which are common to both positions. A broad jumper must have tremendously strong abdominal muscles plus comparatively long "ham strings" to enable him to keep his heels as high as possible in relation to his buttocks. This will enable him to "delay" his landing and allow more time for his forward speed to carry him over a greater distance. Also that the legs must be straight, athletically, and close together so that they reach as far in advance of the c. of g. as possible and not bent as in (Fig. 12).

THE TAKE-OFF

Now let us look for a moment at the take-off. From directly in front the jumper must be immediately above his jumping leg, so that his power, in this plane, is directed vertically upwards and not to one side. From the side, the conclusion has been drawn from the study of nearly all the champions (not just one or two) that the trunk should be kept upright during the take off (Fig. 1, 2, and 3 common to both styles). This position is obtained by the coast over the last three strides. The first two being slightly longer with a slight shortening of the last one. If this last one is over-shortened then, from my own observations, there is a most definite tendency to rotate in the air and the jumper may quite easily land with his feet and face at the same time. This shortening must, therefore, be very small, two or three inches at the most.

THE FLIGHT

As it appears likely, then, that there will be forward rotation, let us consider what effect it will have on the jump. Here again there are conflicting view points with regard to the effects on the different styles. Firstly, it is said that for a body to rotate in the air, the rotation must be originated from the ground. This, so mathematicians tell us, is correct. However, it is claimed that the hitch-kick produces or tends to produce a movement which will stop this forward rotation. This does not seem possible. Surely the only way to stop rotation one way is to start a rotation the other way; but rotation can only start on the ground. Therefore this claim does not seem feasible. A cat, however, can manage to twist itself round while in the air. Whether it is safe to assume that, if it is possible for a cat it must be possible for the man, I do not know. Let us say, then, that the hitch-kick, in all probablity, does not produce a backward rotation.

LEVER ACTION

There is a further point which is more definite. If a body already has rotation then by lengthening the lever the angular velocity (or speed of rotation) is reduced and conversely by shortening the lever the angular velocity is increased. Compare the length of levers in Figs. 4a, 5a, and 6a, with those in Figs. 4b, 5b, and 6b. In the former the body has been kept extended and therefore long; in the latter it has been "balled up" and therefore short. Consequently, in the latter, the speed of rotation is increased and the former it is kept to a minimum. What does that mean in terms of long jumping? In the sail there is a greater tendency for the body to rotate which force the heels much lower in relation to the hips even if the angle between trunks and hips remains constant. Hence the heels will come to the ground sooner and not so far in advance of the c. of g. (Fig. 12 with straight legs). This, then, can quite easily increase the advantage of the landing position (Fig. 10).

THE SAIL JUMP

Why is it, that the sail jumper cannot obtain a landing as shown in Fig. 10? The muscles which operate any joint in the body are attached to some bony structure on either side of that joint. While in contact with the ground other muscle groups can, to a large extent, fix the position of

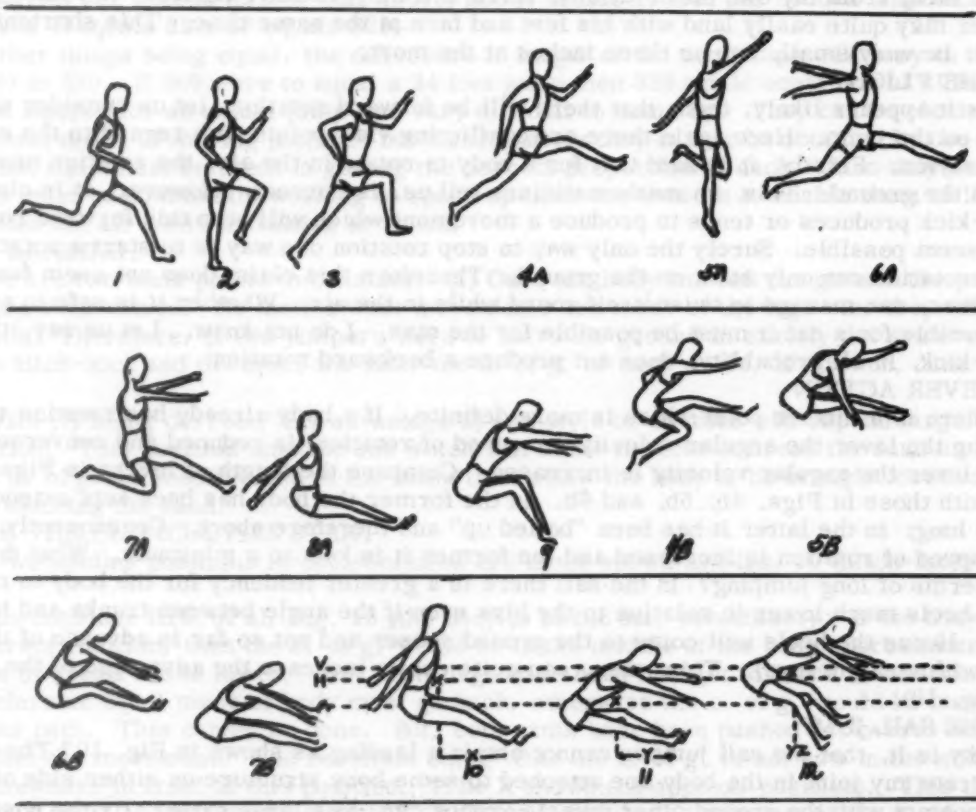
other parts of the body and therefore allow only one part to move. But in the air the fixing of other parts of the body cannot be done. Therefore when the muscles pulling on the legs work to raise the legs, an equal amount of force is acting on the trunk. What happens is that both parts, legs and trunk, are pulled closer together. This has to happen and cannot be stopped because the sail jumper raises both legs as high as possible and holds them there; consequently the trunk has to come forward to meet them.

THE HITCH-KICK

What happens in the hitch-kick? If you look at Figs. 4a, 5a, and 6a, you will notice that the leg on its way backwards is straight and the one on its way forward is bent. They pass through the same angle in the same time. The power, or muscular energy required to move the long lever backwards is far greater than the power needed to pull the short lever forwards. Once again the other end of these operating muscles are attached to the trunk. Therefore there is a greater power pulling the trunk backwards than there is pulling it forwards. Hence the trunk is kept upright while the first leg (i.e. the take-off leg) is got into position for the landing (Fig. 6a). The other leg then comes forward, bent, to make it as short as possible and reduce the pull on the trunk. This movement will, as seen above, tend to pull the trunk forward. While this is happening, however, the arms are being thrown backwards, which again tends to pull the trunk backwards and keep it approximately upright. Therefore, in the hitch-kick, the emphasis is on the backward swing of the straight leg, with the other one being swung forward bent as much as possible. Also that the backward swing of the arms must coincide with the free leg coming forward.

RECOVERY

The landing shown in Fig. 8a presents a greater problem of recovery than that shown in Fig. 7b. Immediately after the heels have broken the sand there should be a giving at the knees plus a vigorous swinging of the arms forward (Fig. 9a). This will prevent the jumper from sitting back in the pit.



Teaching Beginners to Hurdle

by Frank Sharpley

(Regardless of the success enjoyed by top class hurdlers in the U.S.A., few articles have been published in this country outlining progressive stages in teaching the fundamentals of this event. Frank Sharpley, eminent New Zealand coach, has purposely omitted many refinements and details of hurdling important to the mature and experienced performer in presenting this article for the benefit of the raw beginner.)

Task: In the approach, to reach the first hurdle first. Over the hurdles, to change from your normal sprint stride as little as possible. Between the hurdles, to gain speed.

Hurdling is a sprint race, not a series of high jumps (fig. 1). Here is how to learn the style of the boy in fig. 2.

Set out a bench upside-down, or a piece of wood across two sticks 1 foot high. Stand back 10 yards and run over the bench, puting your left foot over first. Now try leading with your right foot. You should use whichever is more comfortable as your lead leg.

Run twice over the bench again, using your correct lead leg, to get used to it (fig. 3). Now try it again, but this time pretend the bench is not there, running, not jumping, over it. If you swing your arms strongly as you run up you will be less likely to 'jump'.

Fig. 1

Fig. 2

Fig 3

Fig 4

You will notice that as you run over the bench your opposite arm and leg go forward together. Try another run-through, pushing your opposite arm even further forward. If you swing your arms strongly before and after the bench you will find it an easier movement (fig. 4).

Fig. 5 shows the next stage. Stand on the leg you push off from, and swing up your leading leg in the three movements shown, knee up, flip straight, and chop down. Practice this many times, standing, balancing the movement by pushing out that opposite arm. Now try this movement as you run over the bench, without jumping higher. If you find you are doing so, bring up your lead leg even faster. This will always cure a 'jump', and is a key to good hurdling (fig. 2).

Now start work on a 2 feet 6 inch hurdle. If you hurdle with your left foot leading stand behind the left side of your hurdle, and on the right side if you are a right-foot lead. Make a guide scratch on the ground, 1 foot beyond the hurdle on 'your' side. Take a step forward to the scratch with your lead foot (fig. 6). Now raise the other leg (called the trail leg) over the hurdle, bend it to right angles at the knee, and turn the toe up and out. As it passes the hurdle bring it high into your stomach for a long stride (fig. 7). Repeat this movement several times, first from standing, then a

Fig 5

Fig 6

Fig 7

walk. When your trail leg is moving freely tie in the movement of your opposite arm as well, driving it forward as you put your lead foot forward to the scratch, then bringing it out and back as your trail knee clears the hurdle as in figs. 6 and 7. As it goes back the elbow bends, the hand drops and slides just outside the trailing knee.

When you can do this movement at a walk, try it at a jog. Make sure you hit the scratch with your lead foot or you may hit the hurdle top with your trail knee. The movement will soon come smoothly, unless you are stiff in the hips; ground hurdling exercises will assist you here.

Stand behind the middle of a 2 feet 6 inch hurdle. Swing your lead leg up bent, straighten it, and rest the back of the heel on the top of the hurdle, at the same time putting your opposite arm forward. Now hop forward, keeping shoulders square to the front till you can put your lead foot on the ground beyond the hurdle. Lift your trail leg and carry it over the hurdle, bringing your lead arm round and back. Bring your trail knee up into your stomach and you are over the hurdle. Repeat this exercise, then walk briskly up to the hurdle, swing your lead leg up fast, and straight down beyond the hurdle, then bringing your trail leg over. When you can confidently 'walk' over the hurdle in this way, jog and then run up and over it thinking about your fast lead leg. You will find your body goes forward to your rising lead leg. As you improve, try to put your chin down to your knee.

Now here are exercises to check that you are clearing the hurdle efficiently. Run over it four times thinking, before you start, "fast lead leg". Repeat another four times for "trail knee out, not under, and trail toe up". Another four times for "lead arm out strongly, then back scraping round trail knee". Check the arm on the same side as the lead leg; it merely continues its sprinting action, not swinging behind your back or wildly outwards (as in fig. 8a). A good rule here is to keep your elbows outside your wrists, as much as you can, as in 8b.

Fig 8a Fig 8b

Fig 9

Fig 10

Fig. 11

The dangerous bent-knee style shown in 8a is caused by a slow lead leg. Another exercise to be tried at this stage is to copy the hurdling movements without a hurdle. Think through the movements you have been practicing, then try them tied together as in fig. 9 (lead leg as in fig. 5, lead arm as in fig. 4, trail leg as in fig. 6). Make sure your lead leg comes up fast, your trail leg out to the side, and your lead hand comes back just outside the trail knee. When you can do six of these full movements freely, one after the other, you are ready for the next stage.

Your next task is to learn your run-up to the first hurdle. (Do not be tempted to try and clear several hurdles yet; you will probably not be going fast enough to get your striding correctly between them.) The normal number of strides to the first hurdle is eight, and you should use seven only if you are very tall. Nine is almost always too many strides; that slight balk caused by having to chop strides will slow you when you should be accelerating furiously.

In order to get eight strides (fig. 10) you may have to change your feet in your crouch start; this is not as difficult as it feels at first. Concentrate on swinging the opposite arm to your new rear foot hard forward in your first stride. Be prepared to stretch for your first hurdle.

Repeat the run-up again and again till from the crouch start to the landing beyond the hurdle is one continued movement.

Now you can try a second hurdle. Put it 2 yards less than it should be from the first hurdle, do a crouch start and fast approach, and take three steps between the hurdles. Move out the second hurdle 6 inches at a time till the hurdles are the full distance apart. If you balk, start again with the hurdles close enough together for you to get three strides. If you are going fast enough at the

first hurdle three steps will fit in, except you are unusually small. Never take four or five steps between hurdles.

Try and use each of the steps between the hurdles to gain speed for the next hurdle, not to recover from the one before as the boy in fig. 11 will have to do, because he has let his leading arm get out of control as it came back. It should have bent, ready for the next stride. Later, when you are more experienced, consider the advantages of knowing the number of run-in strides to the tape, so that you can use a dive or drop finish.

Hurdles Training. Hurdling is sprinting, and so training is similar. However, winter hurdling once or twice a week will give you a great advantage next season. Stay on the sprinter's early schedule, adding the following to the sprinter's work:

Monday. Warm-up and run-throughs the same, plus 40 yards of the hurdling-without-a-hurdle exercise, three repetitions. Ten repetitions over three hurdles with a task for each repetition, "faster lead leg", "elbows wider than hands", "strong swing forward of trail leg into a long first stride", "slam the body down" at take-off. Get to know how fast you can run three hurdles from gun to touch-down form the third, if you have a friend with a stopwatch, for it is a good guide to your speed over the whole distance. Finish with sprinter's repetition 220's on the flat.

Tuesday. As for sprinting, but do your starts over one hurdle.

Wednesday. Sprint-type training but after starts run over the full flight of hurdles three times, against a watch, with 10 minutes rest between.

Thursday. As for Monday.

Competition. Run up to 440 on the flat and whatever races you can get over hurdles, for the more hurdle races you can get each season the better.

Fig 12

Fig 13

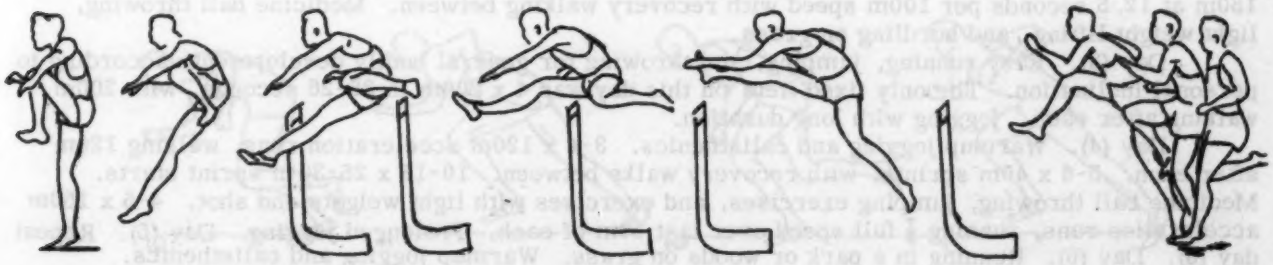
Fig 14

Fig. 15

Fig. 16

This exercise will help your hip suppleness. Sit in the normal hurdle-exercise position (fig. 12). Push forward with both arms to rise on lead foot and rear knee (fig. 13), straighten rear knee and turn to your front (fig. 14), face your rear leg, and keeping it straight at the knee lower yourself to your lead knee (fig. 15), lower until sitting in hurdle-exercise position with trail leg forward (fig. 16). This exercise may need help from your arms at the beginning, but soon you should be able to do all four movements as one big bouncing movement, changing rapidly from side to side and back again.

(The above article was reprinted from "Athletics, a guide book for teachers, coaches, and players," published in New Zealand, by specific permission of its author).



Armin Hary's Training

by Toni Nett, German Coach

During the 1960 Olympic games at Rome, Armin Hary reaffirmed that he is the fastest 100 meter runner in the world. Once again he proved that his world's record of 10.0 seconds is authentic. But what has been the training of this great athlete?

During the decisive years of his development, from November, 1957 to June, 1959, he was coached by Bertl Sumser. In this period the famous German sprinter ran 10.0 in Friedrichshafen, became European champion in Stockholm, and ran 100m in 10.3 on five occasions, 10.2 three times, and 10.0 once. Without special training for 200m, he ran 20.9 (curve), thus he has demonstrated that he might be capable of results in the furlong of equal caliber to his 100m performances.

Bertl Sumser has described the following training of Hary:

November - December: Six workouts per week, alternately easy and hard training. Three and one-half times indoors (where the track has a 50m straightaway, surfaced with rubber), and two and one-half times outdoors.

Day (1), indoors. Twenty minutes jogging and exercises for warmup. 10-12 x 30-40m acceleration runs, reaching $\frac{3}{4}$ full speed, with one minute walking after each. 15-20 x 20-25m easy sprint starts without gun. Walk 10-15 minutes. Medicine ball throwing. 10 minutes running over eight low hurdles (30 inches=76cm) placed three meters apart, going over with alternate legs. Finish with 10-12 minutes handball plus jogging.

Day (2), outdoors. Twenty-five minutes of jogging mixed with calisthenics. 8-10 x 80-100m acceleration runs, walking 100-150 m after each. Walk 10-12 minutes. 200, 300, 400, and 200m runs at a speed according to inclination, with walking for recovery between.

Day (3), indoors. Repeat Day (1), except that 66-88 lb. (30-40kg) barbell substituted for the medicine ball, and 36 inch (92cm) hurdles substituted for the low hurdles.

Day (4), both outdoors and indoors. 30-45 minutes easy running outdoors. Then indoors where the accelerations, starts, hurdles, and medicine ball throwing of Day (1) were repeated.

Day (5), indoors. General bodily development was the purpose during this training session, and the exercises depended upon personal inclination. They usually included handball, easy acceleration runs, starting exercises, some medicine ball throwing, weight training, and relaxed jogging.

Day (6), outdoors. 90 minutes training in woods, repeating many 800-1000m runs. Starting exercises with great exertion.

January - February: The training was of the same type, but the intensity of the training was increased. The speed of the training runs was faster, the weight of the barbell was increased to 132 lbs. (60kg), and the number of series of medicine ball throws and push ups increased (e.g. 20 times from a deep trunk bent forwary position, throwing the medicine ball up to the ceiling. Ten pushups with right and then left hand.)

March - April: Due to better weather, four outdoor and two indoor workouts weekly during March. From the beginning of April, most workouts were held outdoors. Heavy weight-training stopped in March. Intensity of running was increased, although training remained otherwise essentially the same. From the beginning of April, the training included the following:

Day (1) 30 minutes jogging and calisthenics. Jumping exercises, using springing steps. 6-8 x 30m sprints, with walking between. 6-8 x 120m at speed of 12 seconds for 100m, walking for recovery between. 200, 300, 200, 300, and 200m repetitions of easy striding with walking between. Warmdown jogging.

Day (2). Warmup jogging and calisthenics. 12-15 x 30-35m sprint starts without gun. 6 x 150m at 12.5 seconds per 100m speed with recovery walking between. Medicine ball throwing, light weight lifting, and hurdling on grass.

Day (3). Easy running, jumping, and throwing for general bodily development, according to personal inclination. The only fixed item on this day was 4 x 200m in 25-26 seconds, with 200m walking after each. Jogging with long duration.

Day (4). Warmup jogging and calisthenics. 3-4 x 120m acceleration runs, walking 120m after each. 5-6 x 40m sprints, with recovery walks between. 10-15 x 25-30 m sprint starts. Medicine ball throwing, jumping exercises, and exercises with light weights and shot. 4-5 x 150m acceleration runs, running $\frac{7}{8}$ full speed over last 60m of each. Prolonged jogging. Day (5). Repeat day (3). Day (6). Running in a park or woods on grass. Warmup jogging and calisthenics.

Running start, 50, 60, and 100m runs were included. 30-35m sprint starts were included, but the number decreased and intensity increased. 2 x 150m in 11.5 for 100m and 2 x 200m in 24.0 pace, with walks for full recovery following each. Warmdown jogging.

May - June: This was the period of form-building.

Day (1). Warmup jogging and calisthenics. 4-5 x 40-50m sprints with walking between. 2-3 x 120-150m acceleration sprints. 6-8 x 40m sprint starts, three easy, and three fast. 3 x 50m from running start in 5.0 to 4.8 (and later 4.8 to 4.6), walking after each.

100m from running start in 10.0 (later in 9.3 to 9.4, his best). Walk for full recovery. 2 x 200m in 23.0. Walk for recovery between. Warmdown jogging.

Day (2). Warmup jogging and calisthenics. Medicine ball throwing and jumping exercises. Running according to personal inclination of the day, which may include some easy starts, easy acceleration runs, and warm down jogging.

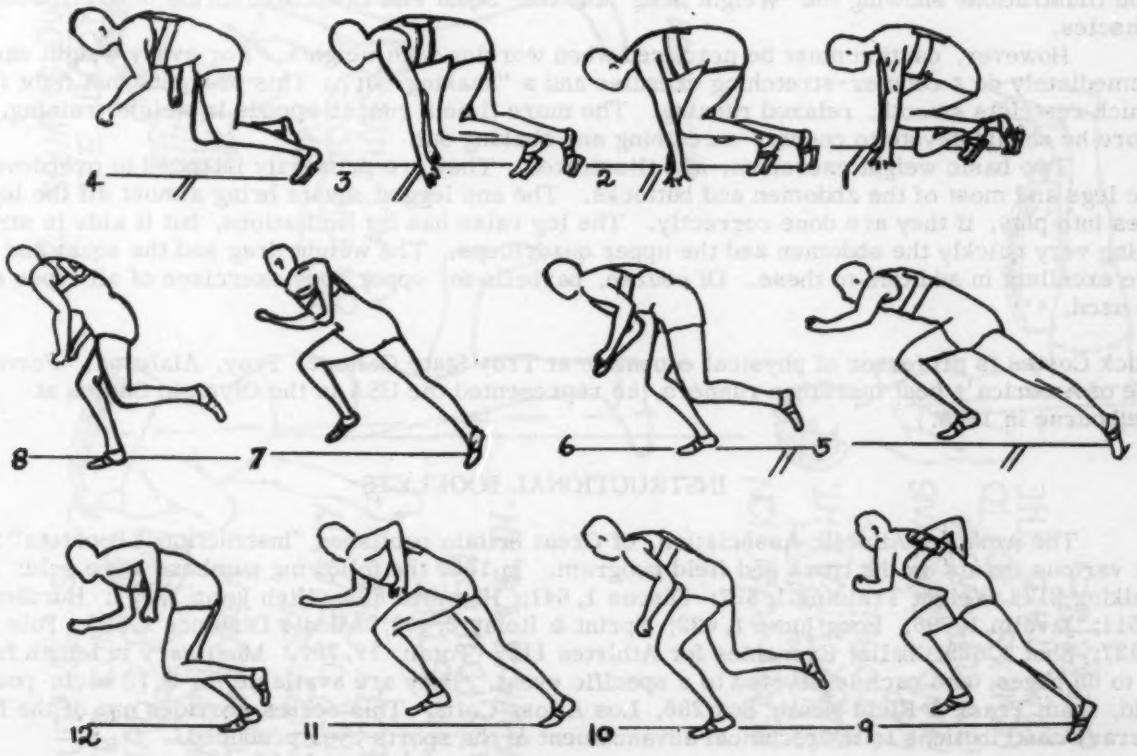
Day (3). Usual warmup. 3 x 120-160m acceleration runs. Walking between. Easy starts. 2 x 50m sprints from blocks. 3 x 50m from running start. 2 x 100m sprints from running start. 1-3 x 200m in approximately 23.0. Walking for recovery after each sprint.

In case Hary raced on the week-end, he had only three workouts per week. Otherwise, Day (4). Warmup. 3 x 150m acceleration sprints. 3 x 20-40m maximum sprints. 2 x 50m sprints from blocks. 2 x 100m, relaxed over first 50m, and full effort over final 50m. 50, 60, and 100m sprints with running start. Walking for recovery following each sprint.

July: Preservation of form. From the beginning of the most important races, the workouts were entirely individual, depending upon inclination, past performances, and coming competitions. In summarizing, here were the outstanding modifications: The number of repetitions was decreased. The speed of the repetitions remained at the same intensity. The number of the training days was not always fixed. The recovery times between repetitions was increased. The intensity of a single workout was ascertained by personal inclination and disposition of the athlete.

Such training has had a beneficial effect upon Hary, as he has become faster, more relaxed, and has achieved greater endurance.

(Reprinted from Die Lehre Leichtathletik, No. 35, Sept. 20, 1960)



Weight Training for Runners

by Nick Costes

The day before the U.S. Team left Melbourne, I spent a very enjoyable three and a half hours talking with Emil Zatopek at his apartment in the Olympic Village. Besides relating his own training methods which he personally wrote on paper for me, he spoke at length about Vladimir Kuts. What I learned then greatly surprised me: Kuts' training methods (which most Russian runners probably use) will inevitably alter the entire concept of distance running.

Watching Kuts run the 5 and 10 kilometers in Melbourne I, as well as everybody else, was astonished at his fearlessness at setting a fast, early pace, his unusually high knee-lift and high kickup, the vigorous use of his arms, the clenched fists, his seemingly extravagant sprints within the course of the race, and his powerful finish. In Kuts there is something more than just ability and love for running.

Zatopek told me that Kuts trains enormously with weights. In the early season, during the winter months, the Russian concentrates on not only developing his upper body, but over-developing his lower body. Zatopek, after beating Kuts in a wintry cross-country race at Paris, remarked that Kuts was then in the early phase of his training, and that the latter was "big, very big, like a wrestler". Later that year, Zatopek humbly confessed his inability to cope with him.

Zatopek did not know the mileage Kuts averaged daily from 1954 to 1956. In 1953, however, the Russian ran 20 kilometers daily, and probably has boosted that average somewhat.

Kuts prefers short dashes in his workouts, ranging from 100 to 400 meters, with very short jogs between. I saw Kuts training only once unfortunately. He did 10 x 400 meters, averaging 65 to 67 seconds for each, jogging 100 meters between. That was his second workout that day; in the morning workout, he had done the same thing. According to his coach, Kuts regarded the day's session quite easy!

Ken Doherty's article, "Basic Training for All Sports" appearing in the March, 1958 issue of Scholastic Coach clearly shows that weight training can be reasonably utilized in track athletics. The illustrations showing the "Weight drag" and the "Squat and Leap" are forms of overloading the muscles.

However, caution must be practiced when working with weights. For every weight exercise, immediately do a counter-stretching exercise and a "shaking-out". This prevents that tight feeling which restricts smooth, relaxed running. The more time a runner spends in weight training, the more he should devote to counter-stretching and shaking out.

Two basic weight exercises, are illustrated. They are primarily intended to overdevelop the legs and most of the abdomen and buttocks. The one legged squats bring almost all the leg muscles into play, if they are done correctly. The leg raise has its limitations, but it aids in strengthening very quickly the abdomen and the upper quadriceps. The weight drag and the squat and leap are excellent in addition to these. Of course, barbells for upper body exercises of all types should be used.

(Nick Costes is professor of physical education at Troy State College, Troy, Alabama. Formerly one of America's best marathon runners, he represented the USA in the Olympic Games at Melbourne in 1956.)

INSTRUCTIONAL BOOKLETS

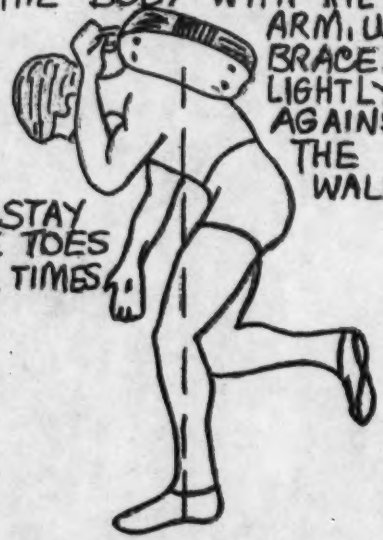
The Amateur Athletic Association, of Great Britain publishes "Instructional Booklets" for the various events on the track and field program. In 1960 the following numbers were sold: Race Walking 217; Weight Training 1, 527; Discus 1, 641; Hammer 803; High Jump 1, 597; Hurdles 1, 511; Javelin 1, 798; Long Jump 1, 632; Sprint & Relay 2, 409; Middle Distance 1, 800; Pole Vault 1, 027; Shot 1, 629; Ballet Exercises for Athletes 116. Total: 17, 707. Most vary in length from 32 to 65 pages, and each is devoted to a specific event. They are available for $. 75 each, postage paid, from Track & Field News, Box 296, Los Altos, Calif. This series provides one of the finest literary contributions to the technical advancement of the sports ever produced.

ONE LEG SQUATS

1. SUITCASE IS PLACED COMFORTABLY ON THE UPPER BACK AND PART OF LOWER NECK.
   SUITCASE'S CENTER OF GRAVITY DIRECTLY OVER LEG.
   THIS IS THE READY POSITION.
   ALWAYS TOE IN.

2. SQUAT SLOWLY, BALANCING THE BODY WITH THE FREE ARM. USUALLY BRACED LIGHTLY AGAINST THE WALL.

TRY TO STAY ON THE TOES AT ALL TIMES.

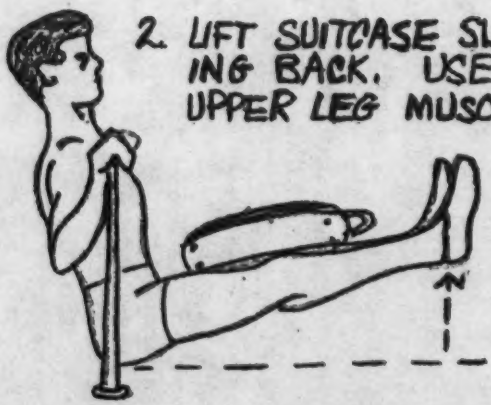


3. WHEN NEARLY FULLY SQUAT (AS IS SHOWN BELOW) STRAIGHTEN UP SLOWLY USING LEG POWER ONLY!
   DO NOT STRAIGHTEN UP USING ANY BACK MUSCLES.

LEG RAISERS

1. READY POSITION.
   SITTING WITH BACK STRAIGHT. SUITCASE ON LAP. HANDS GRASPING ON SUPPORTS (CHAIRS, ETC) TO FACILITATE THE EXERCISE.

2. LIFT SUITCASE SLOWLY; AVOID LEANING BACK. USE ABDOMINAL AND UPPER LEG MUSCLES TO DO WORK.



How They Train

by Fred Wilt

GEORGE KERR, University of Illinois, Jamaica, and West Indies, age 23.

BEST MARKS: mile, 4:24: ¾ mile, 3:10.0: 880 yds, 1:47.8: 800 m, 1:46.4; 660 yds., 1:18.2; 600 yds., 1:09.0, 440 yds., 46.1; 400m., 46.1; 330 yds., 33.8; 220 yds., 21.6; 100m, 10.5; 100 yds., 9.9 seconds.

BORN October 16, 1937, in Jamaica, 5'11" (1.80m), 154 lbs. (70 kg), started racing in 1955 at age 17.

PRE-RACE WARMUP: Begin 40-45 minutes before race. Jog ¾ mile. Walk 440 yds. Stride 440 yds. easily. Calisthenics. 2-3 x 50-60 yds. sprints.

PRE-TRAINING WARMUP: Jog one mile. Walk 440 yds. Stride 440 yds. easily. Calisthenics, 1-2 x 50-60 yds. sprints.

WINTER TRAINING: (December, 1959). Workouts during this period are timed over accurately marked grass area. Monday: 2 x ¾ mile in 3:20. Walk and jog 15 minutes between. Tuesday: 12 x 220 yds. in 30 seconds. Jog 220 yds. in 2½ min. after each. Wednesday: 3 x 660 yds. in 1:30. Jog 5 minutes after each. Thursday: 5 x 330 yds. in 42 seconds. Jog 4 min. after each. Friday: 4 x 440 yds. in 60 seconds. Jog and walk 5 minutes after each. Saturday: 2 x 880 yds. in 2:10. Jog and walk 7-8 minutes between. Sunday: Rest.

SPRING TRAINING: (April, 1960). Workouts during this period timed on cinder track. Monday: ¾ mile in 3:10-15. Walk and jog 15 minutes. 4 x 110 in 12.5. Walk 110 yds. after each. Tuesday: 6 x 220 yds. in 27 seconds each. Jog 220 yds. in 2½ minutes after each. Wednesday: 660 yds. in 1:19. Walk and jog 15 minutes. 330 yds. in 35 seconds. Thursday: 4 x 220 yds. in 25 seconds. Walk and jog 220 yds. in 3 min. after each. Friday: Jog 10 min. Calisthenics. 2 x 110 yds. in 12.5. Saturday: Race. Sunday: Rest.

Kerr jogs ¾ mile as a warmdown after each workout. Most of his workouts are timed, either by a coach, or by himself carrying a stopwatch as he runs. Duration of workouts- 45-60 minutes, starting at 4:00 PM daily. Normally his competitive season begins in February and ends in July or August. He rests from competition during August, September, and October, and starts his winter training program in November. During vacation periods when he has no classes at the University of Illinois, Kerr runs two miles in approximately 10 min. each morning in addition to his usual daily training. He seldom depends upon pre-arranged tactics in his races, "usually goes with the pace," prefers an evenly paced 880 yds. race, and has a terrific finishing "wallop." He last eats 3½ to 4 hours prior to racing. Kerr uses no weight training as such, although twice weekly he works briefly with light wall "pulleys." He was West Indies Champion at 800m. in 1957 and 1959, Big Ten Champion at 440 yds. in 1959 and 1960, and National Collegiate Champion in 880 yds. and 800 meters in 1959 and 1960 respectively. He won the 400 meters title in the 1959 Pan American Games.

He places his starting blocks 17 in. (front) and 30 inches (rear) behind the starting line for his sprint start.

In addition to his official best marks, Kerr has put up some remarkably fast unofficial marks at 440 and 880 yds. in relays during the spring of 1960. Coached by S.B. Francis, Herb McKenley, and Leo Johnson, George Kerr is one of the most personable gentlemen in competitive athletics today. It is difficult to visualize a 400-800 meters runner with more native ability than this battle wise speedster. His sprint, speed, endurance, competitive tenacity, and devotion to training produced a bronze medal in the 800 m at the 17th Olympiad in Rome.

WHY DO THEY PLAY?

In his book, "Exercises for Little Children", J.G. Thulin expressed the essence of childhood so very aptly. "Why do they play?" he was asked. "Because they like it" he replied. In the true spirit of amateur athletics there can be no better answer.

How They Train

· by Fred Wilt

BOBBY JOE MORROW, San Benito, Texas, High School and Abilene Christian College. Age 25.

BEST MARKS: 440 yards, 46.6 (relay); 300 yards, 29.2; 220 yards, 20.4; 200m, 20.6 (curve); 100m, 10.2; 100 yards, 9.3 (equals world record).

BORN October 15, 1935 at Harlingen, Texas, 6'½" (1.87m), 175 lbs. (80 kg.). Started racing in 1948 at age 12. Terminated racing career in 1960 at age 24.

PRE-RACE WARMUP: Begin 45 min. prior to race. Jog ½ to ¾ mile. 10 min. calisthenics. 12-15 x 60-75 yards acceleration runs on grass, reaching near full speed at conclusion of each. Walk for recovery between. Sprint 75 yards. 2-3 short starts from blocks. Rest 5 min. before race.

PRE-TRAINING WARMUP: Jog ¾ mile. 10 min. calisthenics. Ground hurdling exercises.

WINTER TRAINING: (January, with first competition scheduled for the first week of March). Monday: 3 miles cross-country run on road. First 1½ miles at continuous, steady pace. Final 1½ miles alternately sprinting 75-150 yards and jogging 75-150 yards. Then 6-8 x 220 yards in 26-28 sec. Walk 220 yards after each. Tuesday: 3-5 x 110 yards acceleration runs on grass, reaching ¾ full speed at end of each. Walk 110 yards after each. 5-10 x 30-50 yard sprint starts from blocks on grass at ½ to ¾ full effort. 4 x 220 yards on curve in 24-26; Walk 220 after each. Wednesday: If weather cold, repeat Monday's workout. If warm, run 2 x 300 yards in 33-35. Walk 5 min. after each. 6-10 x 100 yards on grass at ¾ full speed, using high knee lift. Walk 100 yards after each. Thursday: Repeat Monday's training if weather cold. Otherwise, 440 in 58, 300 in 34, 220 in 25, and 110 in 11.5. Jog 440 yards after each. Friday: 2-3 x 100 yards acceleration runs using high knee lift, reaching ⅞ full speed at finish of each. Walk 100 yards after each. 2 x 300 yards in 31-32. Walk and jog 5 min. between. Then 15 min. walking and jogging, followed by 10 x 100 yards fast striding on grass. Walk 100 yards after each. Saturday: 10 x 30-50 yards sprint starts from blocks, using ¾ full effort on each. 4 x 220 yards on curve in 24-25. Walk 220 after each. Sunday: rest. In addition to above, at least twice per week Morrow practiced baton exchanges with the sprint relay team at ½ to ¾ full sprinting effort for 15-30 minutes.

COMPETITIVE SEASON TRAINING: (April) Monday: 6-8 x 220 yards in 24-26. Walk 220 yards after each. Tuesday: 20 min. baton exchanging practice, running 50 yards at ¾ full effort with each exchange. 10-12 x 30-40 yards sprint starts from blocks with gun. 2 x 220 yards on curve in 22-23. Walk 5 min. between. Wednesday: 10 min. baton exchange practice on grass. 3 x 150 yards in 14.5-15. Walk 5 minutes between. Thursday: 6-10 x 30-40 yards sprint starts from blocks at ½ to ¾ full effort. Walk back to starting line for recovery after each. 10-12 x 80-100 yards acceleration runs at ½ to ¾ full effort. Walk 80-100 yards after each. Friday: Rest, or 15 min. alternately walking and striding, using high knee lift. Saturday: Competition. Sunday: Rest.

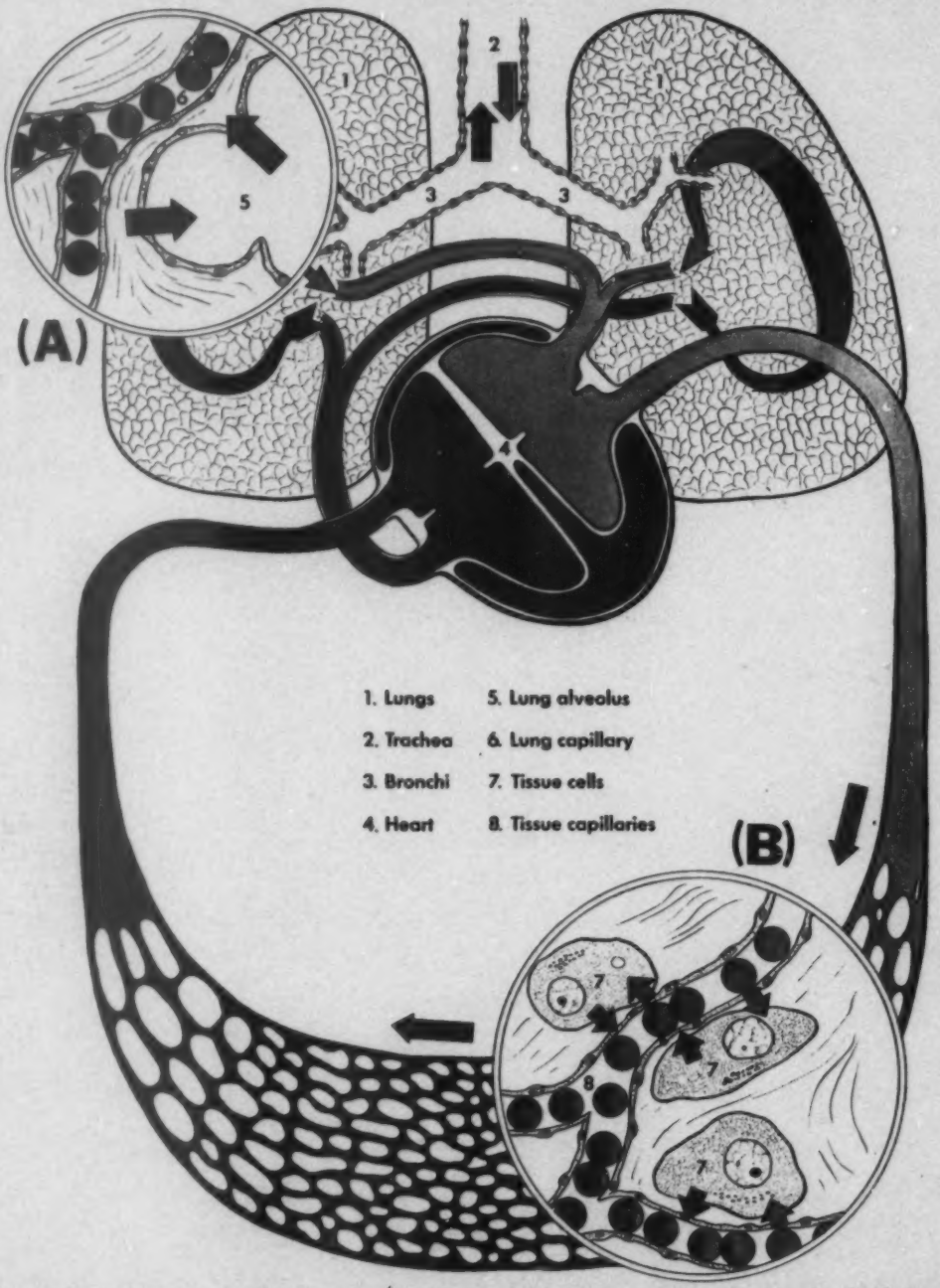
Directly after each warmup during competitive season training, Morrow spent 10 min. running 6-8 x 80-100 yards acceleration runs on grass, using high knee lift, reaching ¾ to ⅞ full speed at the end of each, and walking briefly for recovery between. All workouts were concluded with 10 minutes of easy warmdown jogging. Morrow's front and rear starting blocks were placed 18½ inches and 33 inches respectively behind the starting line. He was coached by Jake Watson and Oliver Jackson. Jackson and Morrow recognized that in sprinting form the runner's heel actually does make firm contact with the running surface for an instant during each sprinting stride, and that the body tends toward an upright position at full speed.

During his final two competitive seasons, Morrow used weight training. During the Fall of the year Morrow ran cross-country with 2½ lbs. weights strapped to his ankles. He also used these ankle weights in running up and down the football stadium steps for 10-20 minutes, three times weekly during the Fall. Morrow never trained more than once daily. His workouts were approximately 90 minutes each, starting at 3:00 PM. He rested two days prior to competition in late competitive season. His last meal was eaten 3½ hours prior to racing, and he participated in approximately 15 meeting annually. His competitive season extended from March to July.

Winner of the James E. Sullivan award and holder of numerous National AAU and NCAA titles, Morrow won the 100 and 200 meters at the Melbourne Olympic Games in 1956. He is rated by Maxwell Stiles in his book "The Greatest Sprinters" as the greatest sprinter who ever lived.

RESPIRATION

Transportation of Oxygen from air to the tissues and removal of Carbon dioxide from the tissues to the air.



1. Lungs
2. Trachea
3. Bronchi
4. Heart
5. Lung alveolus
6. Lung capillary
7. Tissue cells
8. Tissue capillaries

Diagram showing the respiratory and circulatory systems in their common function of transporting oxygen and carbon dioxide through the body. (A) is a microscopic diagram showing the gas exchange between the alveoli and blood capillaries in the lung. (B) is a microscopic diagram showing the gas exchange between blood capillaries and tissue cells. Red arrows represent oxygen flow, blue arrows carbon dioxide flow. Blood cells in the capillaries are shown as red-blue circles in order to indicate the proportional gas content (red-oxygen, blue-carbon dioxide).

Chart reproduced courtesy of A. J. Nystrom Co. (Graphic Health Charts)